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a consultation document - Firth of Forth transport links

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Foreword

This Consultation Document seeks views from all those with an interest in the future of transport links across and around the Firth of Forth. The main features of the transport problems faced today, and likely to be faced in the future, are set out together with some promising solutions.

The analysis presented in this document is drawn from 3 transport studies set up to address short, medium and long term issues of road and rail transport in the study area. I am very grateful to Fife and Lothian Regional Councils, to ScotRail, and to the Forth Road Bridge Joint Board for the hard work in which they have been involved over the last 2 years. I am grateful too for the hard work of the consultancy firms who have provided their expertise to these studies. Efficient and effective transport links within Fife and Lothian, and across the Firth of Forth, are of key importance in maintaining and developing the economy of the area. They are important too for communication generally within Scotland and with other parts of Great Britain. With Scottish industry increasingly looking to the opportunities of the expanding European markets, the Government wishes to ensure that Scotland has in place a transport infrastructure capable of meeting the challenge of the 1990s and beyond.

In recent years there has been a sustained programme of investment in Scotland's transport and this is being maintained. The recent fruits of this investment are now clearly evident with, for example, dualling on the route between Aberdeen and Dundee nearing completion and rapid progress being made with the A74 motorway upgrading, Scotland's key motorway route to the south and Europe. The electrification of both the east coast London-Edinburgh rail route and the Glasgow-Edinburgh route via Carstairs has been completed in recent months.

Recent discussion on transport issues in Britain has increasingly recognised that there are difficult balances to be struck. The demands of jobs and the economy, of the environment, and of access and mobility often pull in different directions. There needs to be a balance between the different transport measures taken so that each can play its role. There is certainly no single or simple transport measure which can cater effectively for all needs or address all problems. In developing a forward strategy for transport in and around the Firth of Forth, the Secretary of State proposes 3 key principles:

- the need to ensure and enhance accessibility to and from Scotland north of the Forth by the maintenance of effective strategic transport links must be a priority;
- any new road capacity must be part of a strategy to protect the environment of Edinburgh by helping to improve public transport access to the city centre;
- any new crossing of the Forth must be environmentally acceptable.

I am particularly grateful for the constructive approach shown by the transport authorities and operators who in the various studies have recognised the different travel needs of different parts of the study area and the existence of travel requirements outwith their particular responsibilities. I am sure that this consultation will allow us to develop a programme of transport improvements in the study area that will command wide support and understanding and bring the continuity of approach essential for practical progress.

The Secretary of State has taken no decisions on the proposals or ideas presented in this document for discussion. He will not do so until views have been received and considered. Clearly, there are some proposals in the document that may command wide support. Others may provoke discussion as to whether the pace of progress suggested is too fast or too slow. Once the views of consultees are available, the Secretary of State will be in a position to draw conclusions on the best way forward. I encourage all those interested to put forward their views to help in decisions on next steps.

JAMES DOUGLAS-HAMILTON MP
Minister for Home Affairs and the Environment
The Scottish Office
March 1992

Summary

1. This Consultation Document seeks views from all those with an interest in the future of travel links across the Firth of Forth.

2. The document contains many facts and figures about travel in a study area comprising the road and rail network on either side of the Forth road and rail bridges. The information is drawn mainly from three studies set up since 1989 to address deteriorating travel conditions, namely:
- the Trunk and Key Principal Road Network Review
- the Forth Road Bridge Short Term Measures study
- the South Fife to Edinburgh Strategic Rail study

These studies have allowed surveys of existing traffic patterns and travel conditions, forecasts of likely future conditions, and the development of proposals for improvement.

3. In guiding the development of a strategy to meet future transport needs, The Scottish Office proposes three key principles which measures should aim to meet, namely:
- the need to ensure and enhance accessibility to and from Scotland north of the Forth by the maintenance of effective strategic transport links must be a priority;
- any new road capacity must be part of a strategy to protect the environment of Edinburgh by helping to improve public transport access to the city centre;
- any new crossing of the Forth must be environmentally acceptable.

4. The work of the various consultants involved has established a major data base of travel patterns and findings which include:
- the level of service on the strategic road network to the west of Edinburgh and in the Forth bridgehead areas is one of the poorest in Scotland and is set to deteriorate further to levels likely to be unacceptable on a key inter-urban route. Without action, the regular current congestion problems will further worsen and become more frequent due to increasing periods when the network will be operating at or near capacity. The high and volatile flows will make the network yet more vulnerable to the minor incidents, accidents, and essential routine daylight maintenance which lead to chronic congestion and unreliability. Congestion on the road network may be reducing the competitiveness of buses to suburban Edinburgh;
- average train loadings are 100% of

seated capacity during peak periods and around 130% on specific trains between south Fife and Edinburgh. Public transport, by rail and bus, between south Fife and central Edinburgh has successfully captured two thirds of the market during the busiest periods. This means that while there is scope for public transport improvements to serve existing passengers better, there is restricted scope for winning further market share on the natural radial corridors for which public transport is competitive. Road congestion on the routes outside Edinburgh results from traffic which is largely orbital or tangential. "Before" and "after" studies on the Bathgate line reopening similarly illustrate that a rail line may be very successful in public transport terms, but still achieve a relatively limited reduction in road traffic on strategic roads.

- Commuting traffic to central Edinburgh from south Fife represents 5% of the total road traffic across the Forth and 12% of the traffic during the typical weekday peak period. The strategic road network is serving diffuse origins and destinations in Fife, Lothian and throughout Britain. As measured on the Forth Road Bridge, some 8% of traffic is from England, the average trip length is 116kms, and some 42% of week-day traffic is commercial and industrial traffic directly supporting the economy.
- Around 90% of travel is by private vehicle and 10% by public transport in the study area. If it were possible for public transport to increase its market share by as much as 50% at the expense of road, then this would represent an 8% drop in road traffic. Road traffic itself has increased by 8% in the 2 year period 1989-1991 and grew at an average rate of 5% each year during the 1980s on key strategic roads in the study area. Whilst this growth rate is not forecast to continue, economic growth will lead to steadily rising road traffic demand;

5. This document puts forward the following proposals for comment based on the study results:

Short Term

- measures to improve toll collection on the Forth Road Bridge including one way tolling and other traffic control improvements;
- discussion for and against the merits of differential peak/off-peak pricing on the road bridge to discourage use during busy periods;
- improvements to rail including new timetabling of services, park and ride, and a new station near Glenrothes.

Medium Term

- an extension of the City bypass ("Barnton bypass") straight to the Forth Road Bridge bypassing Barnton and bringing significant relief to the Gogar, Newbridge, Maybury and Barnton junctions. This brings the opportunity to split city bound and non-city bound traffic and apply appropriate management policies to both. For example, bus lanes could be provided on the A90 (ie Barnton and Forth Road Bridge approaches) to bypass residual congestion without causing "gridlock" once non-city bound traffic has transferred direct to the bypass. The extension to the bypass would increase its attractiveness and would also provide some relief to Corstorphine and Queensferry Road. Quick construction might lead to the link being available as a diversion route and so mitigate the intense disruption that will occur when most of the A90 has to be reconstructed in the immediate years ahead. The scheme has a high economic return;

- a short link direct from the Forth Road Bridge to a new M9 junction near Winchburgh. This puts traffic quickly and directly on to the high capacity M9 and off the single carriageway A904 (bringing a range of operational, travel time, safety and environmental benefits). The scheme has an exceptionally high economic return. The Barnton bypass and M9 link would mean the proposed A8000 dualling from the Forth Road Bridge to the M9 at Kirkliston would not be required as needs would be better met by these new proposals;
- consideration of bus priority and segregation measures associated with the City bypass extension proposals so as to mesh with any JATES follow-up proposals such as an airport to city centre busway;
- a widening of the A90/M90 just north of the Bridge and improvements at Halbeath interchange given that flows are expected to reach almost 70,000 vehicles per day in that area;
- the document asks whether the City bypass should be taken into the national network with the bypass extension complete so as to provide a through motorway/near motorway network from Dunbar to Perth and beyond at that time.

Long Term

- Consideration of a further bridge at South Queensferry following the consultants clear finding that – on engineering, traffic, economic, operational and environmental grounds – any further crossing should be sited to the west of and adjacent to the existing bridge. The cumulative effect of short and medium term measures may usefully 'buy' 2-5 years depending on their actual success in practice and the actual rate of road traffic growth. The document seeks views on the level of commitment there should be to a new crossing. Should steps be taken solely to safeguard the line for the future given the development pressures on currently undeveloped ground or should a firmer commitment be given now?

6. The closing date for comments is 12 June 1992.

1. Introduction

Scope of the Document

1.1 This Consultation Document sets out the role of road and rail in the area around the existing Forth road and rail crossings. It demonstrates the importance of these crossings to the continuing economic health and prosperity of Lothian and Fife in particular and to Tayside and the North-East of Scotland. The present and likely future difficulties are explained and views are sought on a range of possible measures.

1.2 The subsequent sections in the document describe the study area (section 2); the 3 studies from which results have been drawn (section 3); the findings of various surveys which have been carried out and forecasts of likely future travel conditions if no action is taken (section 4). The various measures possible, and their likely effects, are described (section 5). Finally, the various issues for consultation are set out (section 6).

Transport and Planning within the Study Area

1.3 Within the study area, there are a number of bodies with transport or transport related responsibilities. The Scottish Office is responsible for the strategic inter-urban trunk roads. Responsibility for local roads (which in the case of Lothian includes the Edinburgh City bypass) and for some aspects of local public transport, lies with Fife and Lothian Regional Councils. ScotRail, who own the rail infrastructure, including the Forth Rail Bridge, operate the rail services (in association with InterCity). There are a number of bus and coach operators and a ferry service across the Forth.

1.4 BAA Plc operates Edinburgh Airport which lies within the study area. The Forth Road Bridge is operated and maintained by a Joint Board made up of representatives of Fife and Lothian Regional Councils. In the study area, planning has many links with transport. The District Councils, while having no direct responsibility for either road or rail based transport, share with the Regional Council the responsibility for planning within their area.

1.5 Any major transport infrastructure projects will therefore require long term co-operation and commitment from all sides if they are to progress to fruition. The Scottish Office has a particular executive responsibility for the national system of through routes. Consultation on national road proposals in the study area at this time will be of help to others, particularly to the Regions currently preparing their Structure Plans. This Consultation Document aims to help explain the possible ways forward for transport by drawing on the principal results of the 3 studies now coming to completion which have involved the various bodies with responsibilities for trans-port infrastructure. The consultancy firms principally involved were Dougall Baillie Associates, SIAS Ltd, W A Fairhurst and Partners, Pieda, Transportation Planning Associates and The MVA Consultancy.

2. The Study Area

2.1 This Consultation Document addresses the traffic and transport requirements in the study area highlighted within Figure 1. It covers west Edinburgh, the bridgehead area in Fife and the Forth estuary between these 2 areas. Although aspects of contributory studies – for instance the examination of rail use and possible additional Forth crossing locations – extend beyond this area, the major strategic transport issues in east central Scotland lie within this area.

2.2 The development of the transport network in and around the Firth of Forth has undoubtedly played a significant role in the general development and economic prosperity of many communities in Lothian and Fife and further afield. The populations adjacent to the study area south of the Forth are 435,000 and 148,000 respectively for Edinburgh District and West Lothian District, with a total of 750,000 in Lothian Region. Fife Region has a population of 346,000, with 130,000 and 147,000 in Dunfermline District and in Kirkcaldy District respectively. Beyond the immediate study area there is considerable reliance on this transport corridor for commerce, industry and tourism and the corridor provides important access to the south for the 1½ million people who live and work in Scotland north of the Firth of Forth.

Employment Patterns

2.3 Edinburgh provides the highest number of jobs within the study area with 243,000 persons in employment. Many of these employees commute from other areas of Lothian as well as from Fife and further afield.

2.4 The districts of West Lothian, Dunfermline and Kirkcaldy, close to the study area, also provide significant employment of 45,000, 43,000 and 52,000 respectively. Again, the transport network makes possible inter-district travel across the Forth between home and work. There is a high degree of interdependence both economically and socially between the constituent parts of the study area.

Rail Networks

2.5 The full rail network in the study area is shown in Figure 2. The main north-south rail line connects Aberdeen, Perth, Dundee and the north with Edinburgh and the south. A comprehensive local rail network

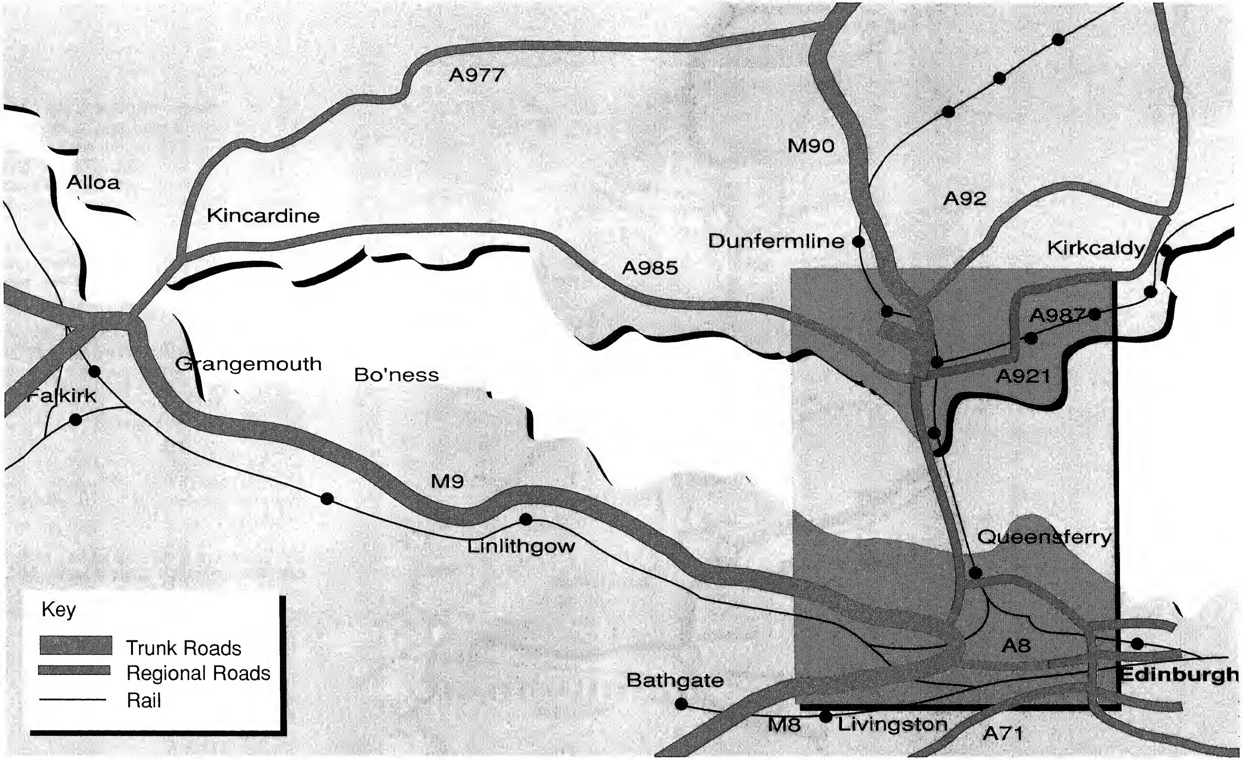

Fig 1 Study Area

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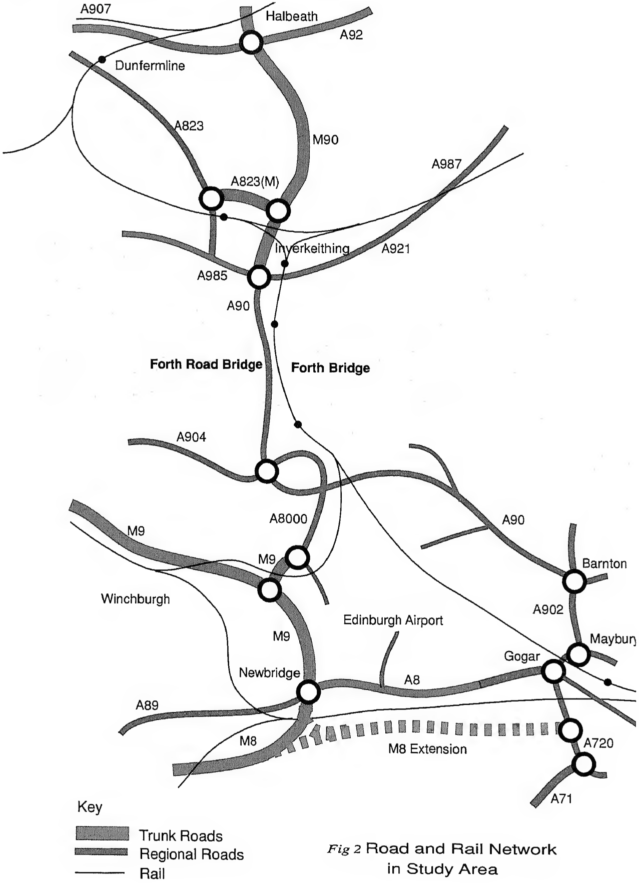


Fig 2 Road and Rail Network in Study Area

services the communities both north and south of the estuary. On the north side of the Forth the local rail network, consisting of the Fife Circle, links almost all the main centres of employment and population of south Fife with Edinburgh. The South Fife to Edinburgh Strategic Rail study is reviewing proposals to increase the number of stations in Fife in the near future.

Road Network

2.6 The strategic roads, both trunk and regional, have developed into the network shown in Figure 2.

2.7 Within Fife, the key routes are the recently completed A92 East Fife Regional Road and the M90/A90 from the north.

2.8 There are a number of key routes linking Lothian, and particularly Edinburgh, with the national road network. These include the A90 from

Fife; the A8000 between the Forth Road Bridge and the M9; the M9 from Stirling and the M8/A8 from Glasgow and the west which in turn links to the M74/M6, Scotland's key route to the south and Europe. The A720 Edinburgh city bypass links to routes to the Borders and the A1 south to Newcastle and north east England.

2.9 A specific Government priority on the M8/A8 corridor is the construction of the M8 extension from Newbridge to the Edinburgh city bypass. This scheme will significantly relieve traffic congestion at Newbridge roundabout and the A8 and thereby greatly improve access to Edinburgh Airport. The detailed proposals for the scheme have recently been the subject of a public local inquiry. The M9, M8/A8 and M74/M6 are all trunk roads.

2.10 The nearest estuarial crossing beyond South Queensferry is at Kincardine, 22 kilometres away.

2.11 The land use in the study area is undergoing a period of growth and change. There are currently a number of proposals at various stages of planning and preparation for industrial, commercial, retail and residential development in Lothian and Fife. Major sites in west Edinburgh adjacent to the City bypass and in the Fife bridgehead area are to be developed for business use generating increased employment levels which will consequently have an affect on travel patterns particularly in the immediate area.

3. The Three Studies

3.1 The Scottish Office, Fife and Lothian Regional Councils and the Forth Road Bridge Joint Board all recognised the rapidly growing problems on the transport network in west Edinburgh, the bridgehead area of Fife and on the Forth Road Bridge. In 1989, the first of 3 important complementary transport studies which have the support of all 4 bodies concerned was started seeking to address these complex issues.

Trunk and Key Principal Road Network Review

3.2 The economic growth seen in the 1980s led to greatly increased demands on Scotland's key strategic routes and The Scottish Office decided to commission a wide ranging review of the trunk and key principal road network. The aim of the review was to ensure that this network, providing the vital links between population centres in Scotland, was in the best possible shape to meet the demands of the latter part of the century and into the next. Tasks within the review included an assessment of trends in traffic growth, the potential pressure points on the network, the role of road improvements in serving economic development, and an assessment in strategic terms of how changes on the rail network might affect road based travel.

3.3 The review is now substantially complete. The final results are being analysed by The Scottish Office to assist in developing its future strategy for trunk roads. The engineering consultants commissioned to undertake this work were Dougall Baillie Associates, SIAS Ltd and W A Fairhurst and Partners and consulting economists Pieda.

3.4 It was clear at the outset of the review that the increasing congestion north and south of the Forth Road Bridge would require particular attention (see Figure 3). Problems of increasing con-gestion were apparent at Newbridge, Gogar and Barnton roundabouts near Edinburgh; at Halbeath interchange near Dunfermline; and on the A90/ M90 and A8/M8 corridors. A key element of the review was therefore to identify options and investigate the general engineering and environmental feasibility, and costs, of improving the road infrastructure in west Edinburgh, the bridgehead area in Fife, and over the

Firth of Forth. As the review progressed, and the likely future problems in the study area were confirmed, it was evident that additional detailed analysis was required to complement the review. For this reason 2 other studies, the Forth Road Bridge Short Term Measures study and the South Fife to Edinburgh Strategic Rail study were commissioned in parallel.

3.5 An important aspect of the review work was the development of a traffic model centering on the Firth of Forth. This model was used to replicate current and projected traffic movements both through and within the study area. This allowed a range of schemes to be tested for their effectiveness in dealing with present and future traffic problems and for economic appraisals to be carried out which considered the value of reduced delays, travel times and accidents.

3.6 The data collected and available on the Forth Road Bridge as part of the

Critics ill-informed, says report

'DELAYS WERE INEVITABLE'

Back and Forth

Clearing the way to work

RUSH-HOUR traffic chaos on the Forth Road Bridge is expected to ease today.

Commuters have been faced with bumper-to-bumper snarl-ups on the way to and from work because of road repairs to the A90 in Fife.

by RAYMOND NOTARANGEL

BRIDGE DELAYS LOOM

Overload fear on Forth Bridge

By ALAN HUTCHISON

Motorists' misery to continue

DISASTROUS traffic conditions on the Forth Road Bridge will NOT be relieved within the next decade.

That's the message from Scottish Office Minister Lord James Douglas-Hamilton in a letter to Linlithgow MP Tam Dalyell.

He wrote: "The Scottish Office, with the technical assistance of Fife and Lothian Regional Councils and the Forth Road Bridge Joint Board, has commissioned consultants to examine the feasibility of a further Forth crossing..."

He added: "It is not realistic to expect that any new crossing could be in place before the end of the decade."

Mr Dalyell warned that it would be more difficult to build another bridge because the best site was taken by the bridge built in the 1960s.

EXPRESSED CONCERN

The Linlithgow MP had previously expressed concern about the traffic choking points of west Edinburgh, the Barnton roundabout, the Forth bridge and the Newbridge roundabout.

He told the House of Commons: "My first concern is the Barnton roundabout. It is one of Europe's biggest choke points."

Bridge traffic set to break new records

THE Forth Road Bridge is back on course for another record-breaking year.

review were exceptionally comprehensive for a study of this type. The Forth Road Bridge provides a near perfect catchment point at which to monitor traffic volumes and survey movements. In addition, accurate and detailed records of traffic volumes on a day by day basis have been maintained over many years. A series of roadside censuses were carried out in 1990 and 1991 which included random sample interviews to determine vehicle types, journey purposes, origins, destinations and other relevant information by time of day. An unusual feature of the sample technique was that it was carried out daily for a full 7 day week and also repeated 4 times, once for each season of the year. In this way a full appreciation of the pattern of use of the road network in the study area and the different demands on it over the course of a full year was established. In addition, since a conventional roadside census was also carried out in 1983, an understanding of the changes in travel patterns over time has been possible.

3.7 An Executive Summary of the review findings will soon be published.

Forth Road Bridge Short Term Measures

3.8 The second of the studies used to help prepare this document is the study into short term measures on the Forth Road Bridge. Since any major infrastructure developments could not realistically be constructed for some years, a study of short term measures to tackle the current traffic difficulties on the Forth Road Bridge and surrounding network was initiated. The purpose of this was to identify a series of measures for implementation within the immediate 2-5 year period. In late 1990, The Scottish Office, Fife and Lothian Regional Councils, and the Forth Road Bridge Joint Board formed a steering group to develop measures to 'stretch' the ability of the network on and around the bridge to meet the rising traffic demand. Consultants, Transportation Planning Associates, were appointed in mid-1991 to explore a wide range of possible measures which included:-

- improving public transport services to increase patronage;
- increasing the capacity of the bridge with extra lanes;
- adopting 'tidal flow' systems, priority lanes and other traffic management and control measures to improve capacity or regulate demand on the bridge and its associated road network in Fife and Lothian; and
- introducing streamlined toll collection methods.

South Fife to Edinburgh Strategic Rail Study

3.9 This third study was initiated in 1991 by Fife Regional Council and ScotRail with Lothian Regional Council, The Scottish Office and Fife Enterprise as contributors. The MVA Consultancy were appointed to this commission in mid-1991. The study is investigating the potential demand for rail travel in the south Fife to Edinburgh corridor in the next 10 years. This work is continuing and expected to lead to recommendations on changes to rail services and infrastructure such as stations, car parks, rolling stock and signalling.

3.10 A key objective is to assess any potential for transfer of commuters from road to rail in order to relieve traffic pressure on the Forth Road Bridge and the road network into Edinburgh.
3.11 Both the Forth Road Bridge Short Term Measures commission and the South Fife to Edinburgh Strategic Rail study are substantially completed and their emerging conclusions have been taken into account in preparing this document. The detailed reports will be available to the commissioning bodies during the consultation period.

3.12 A very relevant but separate study was "JATES" – the "Joint Authorities Transportation and Environmental Study" – commissioned by Lothian Regional Council, The Scottish Office and Edinburgh District Council which reported in mid-1991. This study, undertaken by The MVA Consultancy in association with Pieda and Turnbull Jeffrey Partnership, included a long term examination of transport in Edinburgh including travel patterns and trends. The forecasts developed in JATES have been considered by the various consultants carrying out work on the Forth estuary studies in relation to traffic travelling into Edinburgh, recognising the demand management policies for traffic into the City. Similarly, the consultants have taken into account the work carried out on illustrative JATES strategies for transport policies within the City in preparing their recommendations for measures so that they are likely to be complementary outwith the urban area. Lothian Regional Council are expected to announce shortly how they propose to carry forward the JATES recommendations.

4. Survey Results and Analysis

Historic Travel Demand

Rail

4.1 ScotRail and InterCity services meet a steady and regular demand for travel between south Fife and Edinburgh. However, the relative contribution of road and rail to passenger traffic within the study area changed following the opening of the Forth Road Bridge. Increasing demand for travel and changing demographic patterns which both Forth bridges have made possible has also ensured that rail patronage over the recent years has continued to increase.

Road

4.2 The Trunk and Key Principal Road Network Review revealed that there has been much higher growth on the strategic road network than on other major routes, particularly urban roads. The latter have generally shown modest growth overall during the 1980s. A reliable yardstick of historic traffic growth on the strategic roads within the study area is provided by the audited traffic volumes on the Forth Road Bridge. Figure 4 shows the growth between 1964 and 1991.

4.3 Growth in total bridge traffic has generally been continuous and steady over this 27 year period, averaging just below 5% per annum. The fastest growth occurred in the mid to late 1980's. Despite the recession in the national economy during 1991, traffic levels on the bridge rose by over 3.5% between the last quarter of 1990 and the corresponding quarter of 1991.

4.4 Both Fife and Lothian Regions have rates of car ownership greater than the Scottish average (302 and 317 cars per 1000 population respectively as against a Scottish average of 294) but less however than the GB average of 363. The increase in car ownership over the 10 year period 1980-1990 for Fife, Lothian and Scotland was 32%, 45% and 36% respectively which exceeded the average for Britain as a whole, at 31%. These figures suggest that Scotland is catching up with GB car ownership levels, but has some way to go yet.

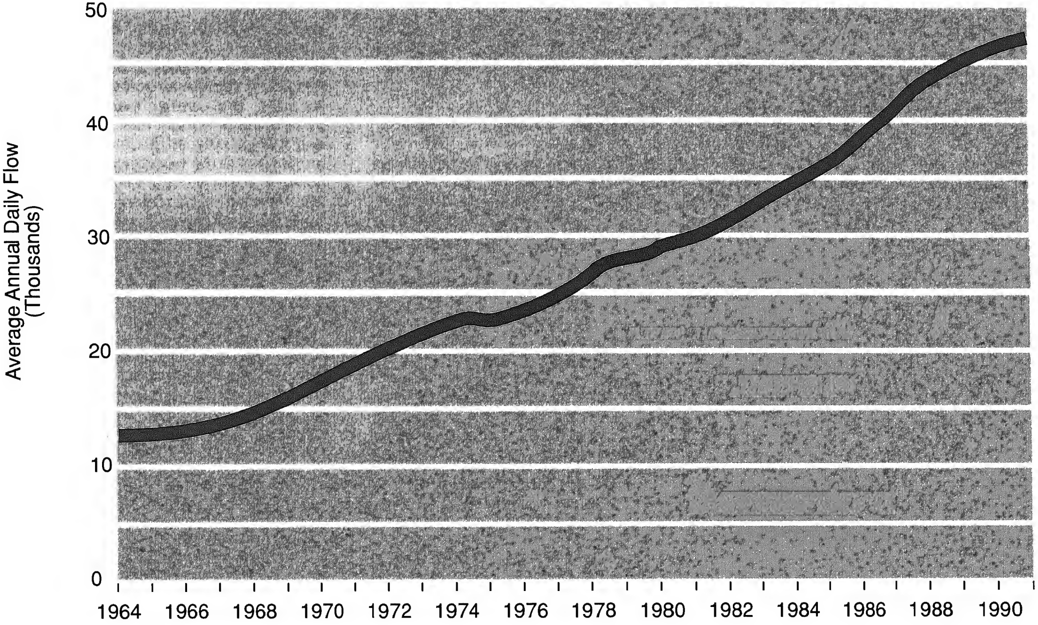
Flow Levels

Rail

4.5 South Fife to Edinburgh rail travel is served by the Fife Circle and by services from Dundee, Aberdeen, Perth and Inverness. In a 12 hour

Fig 4 Forth Road Bridge

Traffic Growth 1964-1991



The figure shows how traffic has grown on the monitoring point provided by the Forth Road Bridge between 1964 and 1991. The growth has averaged almost 5% with traffic increasing by over a third in the 1985-1990 period. Even in recession year 1991, traffic grew by 3%. Growth on Scotland's key strategic road network is substantially higher than growth on all other road types – the urban, leisure and rural roads. Traffic within cities is growing least fast.

Source: Trunk and Key Principal Road Network Review

period on an average weekday, around 50 train services into Edinburgh collect passengers in Fife. These services run throughout the day but are timetabled to reflect the demands in the morning and evening peaks. In the morning peak hour 8 trains southbound are provided from various origins across the bridge to Edinburgh.

4.6 Recent counts indicate these southbound trains carried in total 5100 passengers in the busiest 12 hour period. The number of passengers travelling between south Fife and Edinburgh were estimated to make up 54% of this total with the remainder from origins further north. During the busy morning peak hour approximately 1550 passengers cross the Forth Rail Bridge to Edinburgh with 83% of that number travelling from south Fife to Edinburgh.

Road

4.7 Throughout the year there are wide variations in the road traffic flows in the study area. The trends in traffic flow on the Forth Road Bridge are fairly typical of the main routes through the study area.

4.8 Flows are highest in the summer months peaking in August with average monthly 2-way flows reaching over 53,000 vehicles each day in August 1991. January and February are the months with the lowest flows where the average recorded daily flows are just less than 40,000 vehicles each day. Within each of these months there are variations according to the day of the week. Friday is consistently the busiest day of the week with the weekend, generally, containing the quietest days. However, especially during the summer months, at holiday weekends, and during special events such as major golf tournaments at St Andrews, the Air Show at Leuchars, major football matches, weekend flows regularly exceed weekday flows. Daily flows in excess of 60,000 vehicles are becoming a more regular feature.

4.9 The peak periods of flow during a typical weekday are in the early morning and early evening. This reflects the important role the network and bridge play in the movement of employees to the workplace. The peak flows of commercial traffic are during the working day. During a typical weekday peak period the 2-way flow is likely to be between 4,000 and 5,000 vehicles per hour with the directional flow at around 2500-2800 vehicles per hour. At this level, which is the practical free flow capacity of the bridge, the operational problems and volatility of traffic flow are very evident. These levels of flow already occur twice a day every working day of the year. Flows in the remainder of the working day, containing high proportions of commercial traffic which reduce practical capacity, are rising and the period around the peaks is spreading. Other peaks at different times of day and year are rising and causing increasing difficulties. The rising traffic volumes result in an increasing total number of hours per year in which the network experiences flow levels which lead to delays.

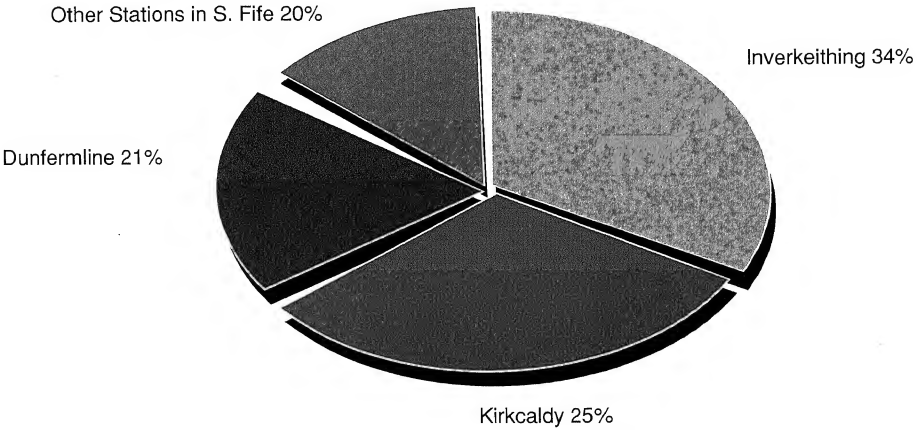
Origin & Destination Patterns

Rail

4.10 The pattern of railway station use between south Fife and Edinburgh is shown in Figures 5 and 6. These figures show the relative usage of stations of origin, and stations of destination, during an average day for journeys between south Fife and Edinburgh. Within south Fife, Inverkeithing, Kirkcaldy and Dunfermline stations dominate with 34%, 25% and 21% of passenger departures respectively. Inverkeithing stands out even more in the morning peak period accounting for 42% of the rail journeys from south Fife. No other stations attract more

Fig 5 Railway Station Use in South Fife

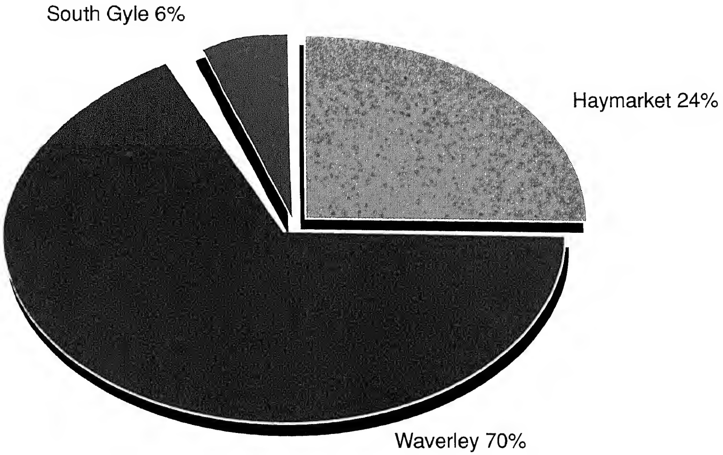
Between South Fife and Edinburgh



Source: South Fife to Edinburgh Strategic Rail Study

Fig 6 Railway Station Use in Edinburgh

Between South Fife and Edinburgh



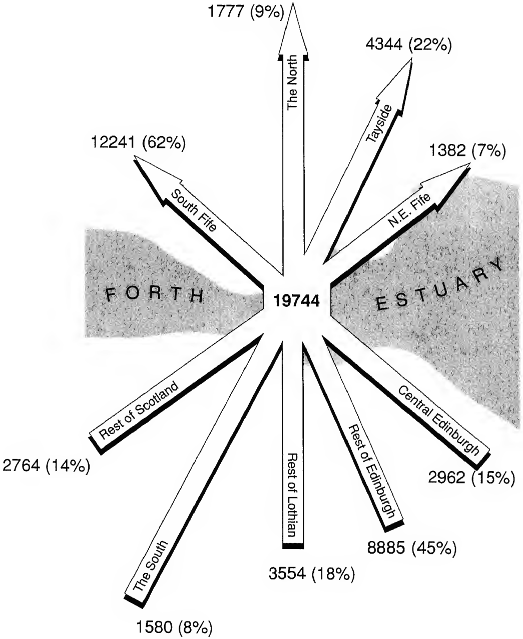
Source: South Fife to Edinburgh Strategic Rail Study

than 5% of the total. Within Lothian, Waverley and Haymarket are the preferred destinations, with 70% and 24% respectively over the busiest 12 hour period. The dominant modes of travel to the 3 main stations in Fife are car and walking. In the morning peak over half the passengers (59%) used a car to reach the station while 30% walk. At the Edinburgh end of the journey over 80% of rail passengers in the morning peak and the inter-peak period walk from their station of arrival to their final destination.

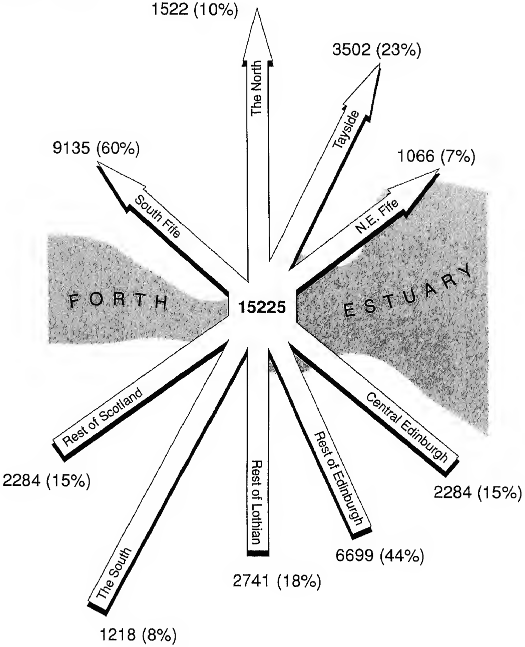
Road

4.11 Figures 7, 8, 9 and 10 show the origin and destination of traffic crossing the bridge northbound between 7am and 7pm on an average weekday in June 1990. For operational reasons, principally the safety of the enumerators collecting the survey data and to minimise delays to road users, all the roadside surveys on the Forth Road Bridge were conducted northbound adjacent to the toll booths.

Figs 7 & 8 Forth Road Bridge Northbound Traffic Flows
(Weekday June 1990)



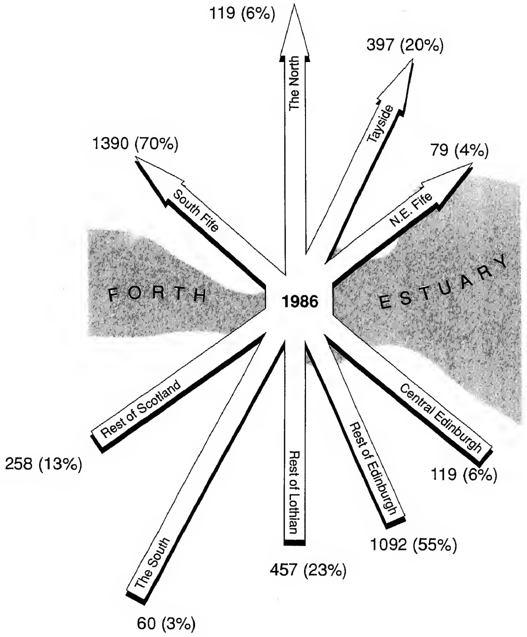
12 Hour Day



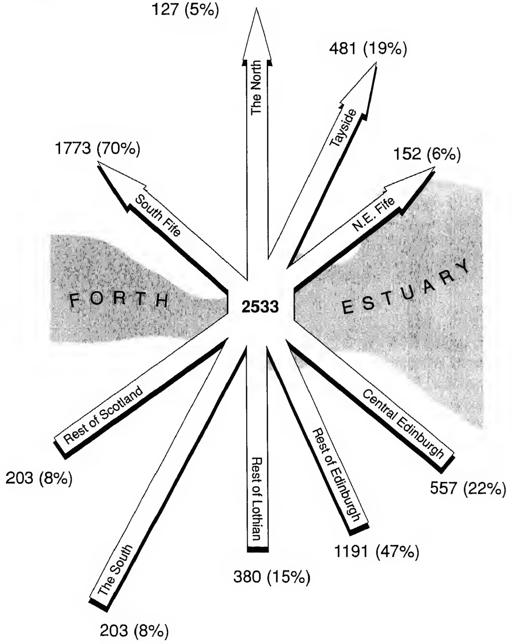
Off Peak

Figs 9 & 10 Forth Road Bridge Northbound Traffic Flows

(Weekday June 1990)



AM Peak (8.00-9.00)



PM Peak (5.00-6.00)

4.12 A number of points should be noted from these figures. Firstly, it is clear that the bridge and the surrounding network serve both a national and a local function. A large proportion of the traffic is only moving between Fife and Lothian and the bridge is obviously very important to the people living and working immediately in its vicinity. Beyond the Firth of Forth it is also important to Tayside, and to the regions and districts further north. For locations south of the Forth, it is important for trips from England (and beyond) as well as the regions in the southern part of Scotland. Journeys to Tayside account for around 22% of the weekday destinations while regions further north make up another 9%. Trips with an origin in England or beyond account for 8% of the total daily trips across the bridge. Some 20% of the goods vehicles are travelling from England and beyond.

Passenger Market Shares – Bus, Rail and Private Vehicle

To and From Central Edinburgh

4.13 On an average weekday, 15% of the private vehicle passenger traffic across the bridge is travelling to the central area of Edinburgh within reasonable distance of Waverley and Haymarket Stations. On an average weekday, 5% of the road passenger traffic across the bridge is local commuting to and from work: in the peak periods alone this figure is 12%. The peak directional flow (ie morning inbound and evening outbound) is 550 vehicles per hour to central Edinburgh for all trip purposes from all destinations north of the bridge.

4.14 At present approximately 1300 people use rail to travel to central Edinburgh from south Fife in the morning peak hour. Between south Fife and central Edinburgh there are 8 regular bus services in the morning peak hour carrying approximately 290 people over the Forth. When com-pared with the 550 cars and vans (or nearly 720 people contained within these private vehicles) it emerges that the current market share to central Edinburgh from south Fife is approxi-mately 56%: 13%: 31% between rail, bus and private vehicles (see Figure 11).

4.15 Public transport from south Fife to central Edinburgh, during the peak periods, is therefore serving over two thirds of this particular market. Rail has already captured a large proportion of the market segment for which it can compete. This limits the scope for further switching to rail in the weekday peak.

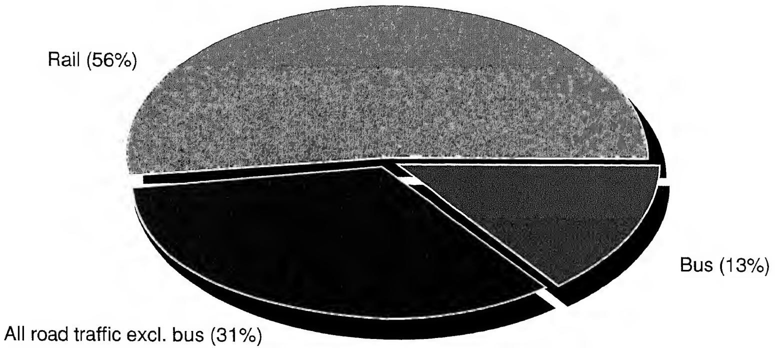
To and From Suburban Edinburgh

4.16 During a typical weekday more people crossing the bridge are

Fig 11 **Modal Split**

Morning Peak Hour Passenger Trips From South Fife to Central Edinburgh

(Typical Weekday 1990)



Sources: Trunk and Key Principal Road Network Review
Forth Road Bridge Short Term Measures
South Fife to Edinburgh Strategic Rail Study

travelling by private vehicle to suburban areas of Edinburgh than to central Edinburgh (45% of trips compared to 15% of trips). The volume of traffic leaving suburban Edinburgh in the morning peak is almost equal to the volume arriving. Rail is however at an inherent disadvantage in seeking to compete for this traffic with private vehicles outside the densely trafficked routes serving large numbers wishing to travel close to the stations. This is reflected in the morning peak hour proportions with 74% of rail travellers going to central Edinburgh and 26% to suburban Edinburgh. This highlights also the importance for new stations close to new development in the west of the City. Buses are better placed to compete but flexibility in serving several destinations can only be provided at the expense of increased journey times which are unfavourable in comparison with private vehicles. Buses too at present attract only a small share of the market across the Forth to suburban destinations.

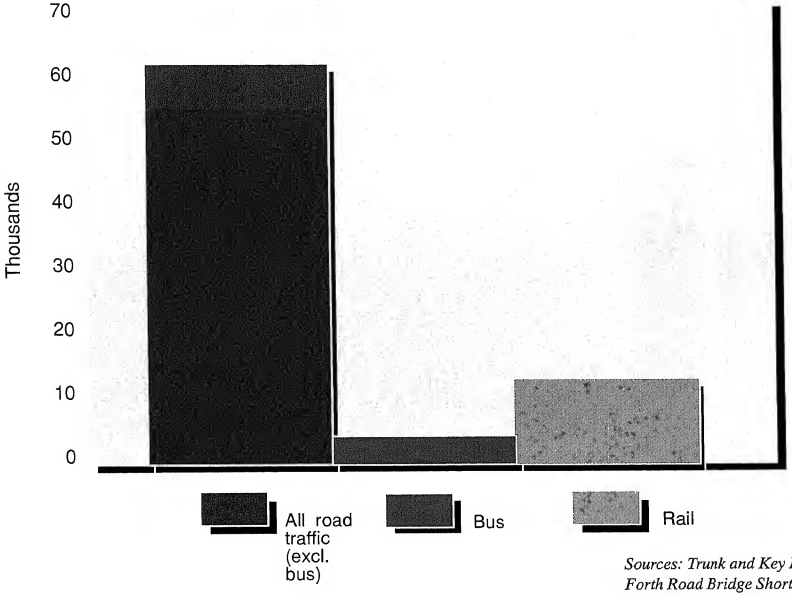
To and From All Destinations

4.17 The total daily cross Forth movements via the 2 bridges, as shown in Fig 12, illustrates the large difference in the number of people crossing by public transport compared to private transport. If it were possible to increase the rail and bus passenger volume by 50%, the road traffic would therefore decrease by approximately 8%: equivalent to 2 years road traffic growth in recent years. To achieve a 50% increase public transport, particularly bus, would have to become competitive in new market areas. Similarly, while the re-opening of the Bathgate rail line has been very successful and attracts over 1 million passengers per year, its impact in removing road traffic from the west of Edinburgh has been limited because the element of former car passengers attracted is small in comparison with the road traffic flows and their natural growth.

Fig 12 Modal Split

Daily Passenger Flows Across Estuary 1990

(typical weekday)

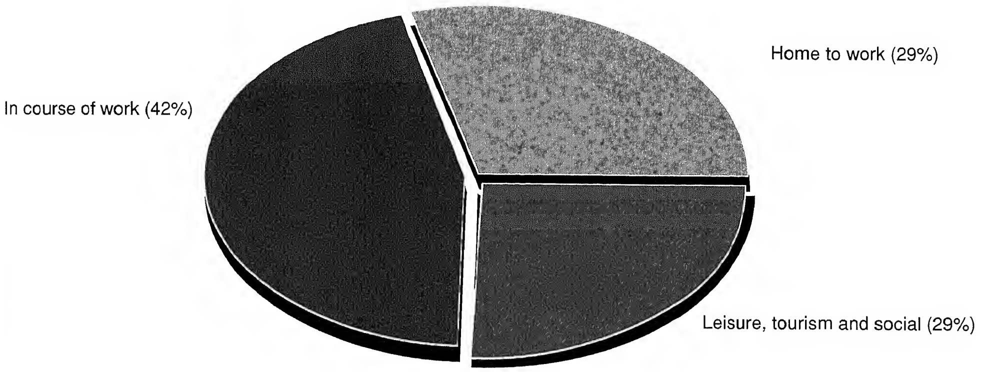


Sources: Trunk and Key Principal Road Network Review
Forth Road Bridge Short Term Measures
South Fife to Edinburgh Strategic Rail Study

Fig 13 Trip Purpose

Forth Road Bridge Northbound Traffic Flows

(Weekday June 1990)



The Forth Road Bridge serves several functions – local, regional and national. different journey purposes make up the traffic mix at different times of day, at weekends, and at different times of the year.
Taking the year as a whole, during an average weekday, only 5% of traffic is commuting to and from central Edinburgh but this rises to 12% in the peaks. Commuting journeys to and from all destinations accounts for 29% of daily trips and 50% in the peak. In-work time traffic remains constant throughout the entire working day at around 42% and accounts for between 23% and 40% of trips in the peaks.

Sources: Trunk and Key Principal Road Network Review

Journey Purpose

Rail

4.18 During the morning peak hour the dominant journey purpose of travellers to Edinburgh from Fife is commuting to work at 80%, with another 15% travelling to university, college or school. During the off-peak period, shopping trips, trips to places of education, and commuting to work are the main reasons for travel with 26%, 23% and 23% of the total number of journeys respectively.

Road

4.19 Figure 13, shows 29% of those who travel across the bridge are travelling from home to work or back on a typical 7am-7pm weekday. However commerce and industry are the dominant users with 42% of traffic, with goods vehicles making up almost a quarter of this figure. This reflects the important role the bridge plays in the local and national economy. Leisure, tourism and social pursuits account for 29% of traffic.

4.20 Further more detailed analysis of journey purpose by time of day and by origin reveals that only 12% of trips northbound over the bridge in the evening peak are commuters from central Edinburgh making the homeward trip to Kirkcaldy and Dunfermline districts in Fife. Over a typical weekday, such commuting trips represent only 5% of the total bridge traffic.

4.21 Comparison of the August 1990 surveys on the Forth Road Bridge with an identical survey in 1983 highlights a changing pattern of use of the transport network in the study area. Table 1 shows that the highest growth in trip numbers by journey purpose is in leisure trips, up by a exceptionally large 66%, followed by goods vehicles trips.

Forth Road Bridge – Roadside Interview Survey Analysis (1983-1990)

TABLE 1

NUMBERS OF TRIPS NORTHBOUND DURING THE BUSIEST 12 HOUR PERIOD OF A TYPICAL WEEKDAY

TRIP PURPOSE	NO OF TRIPS		
	1983	1990	% CHANGE
COMMUTING	3915	5078	+30%
BUSINESS	4008	4846	+21%
LEISURE	4754	7912	+66%
LGV + HGV	2336	3437	+47%
TOTAL	15013	21273	+42%

4.22 A generally similar pattern emerges in terms of the average journey length of vehicles using the bridge, which in total increased by 37%. This is shown in Table 2. The growth of 66% for leisure trips is well in excess of the other groups. Only commuting, of the 4 trip purpose groups showed an overall decrease in trip length, down by 4%.

Forth Road Bridge – Roadside Interview Survey Analysis (1983-1990)

TABLE 2

TRIP LENGTH ANALYSIS

TRIP PURPOSE	TRIP LENGTHS (Kms) 1983	1990	% CHANGE
COMMUTING	39.9	38.5	-4%
BUSINESS	108.2	118.4	+9%
LEISURE	97.0	161.1	+66%
LGV + HGV	96.6	120.6	+25%
AVERAGE	84.4	115.6	+37%

Future Travel Demand

Rail

4.23 With further economic growth, there is every reason to expect demand for rail passenger traffic to increase between south Fife and Edinburgh. The consultants have taken into account expected underlying growth in demand when preparing their forecasts of expected usage for particular rail proposals.

Road

4.24 Forecasts of traffic growth for particular road projects are generally based on the Government's National Road Traffic Forecasts (NRTF) which give a range of predicted levels of traffic demand. The consultants have based their recommendations on growth assumptions which are constrained considerably from the national ranges of "low" and "high" growth in demand. This was to reflect the lack of road space and traffic restraint policies within Edinburgh. It was felt important not to over-emphasise the economic benefits which the recommended future road network enhancements might bring. The study forecasts did however include additional trip estimates to reflect major committed development proposals within and immediately adjacent to the study area (although in overall terms the trips from these developments accounted for only a small percentage of the total trips in the study area). Thus the forecasts are realistic but cautious in terms of not over-emphasising likely future problems. There is clearly a fine line between caution and complacency which the forecasts seek not to cross. At about 2% per annum traffic growth across the Forth is in fact forecast to be less than seen in recent years. Growth into Edinburgh has been taken as forecast by the "JATES" study at approximately 1.5% per annum.

Present and Future Stress Points on the Transport Network

Rail

4.25 The South Fife to Edinburgh Strategic Rail study highlights a number of emerging difficulties in relation to rail travel. The most obvious difficulty is overcrowding in the peak periods. During the morning peak hour passenger loadings on trains crossing the Forth Bridge are estimated to be 100% of seated capacity. This is an average figure and on specific trains loadings are much higher typically reaching 130% or so of seated capacity. In contrast, in the off-peak period when fewer trains run, the passenger loadings are only 55%. Difficulties in relation to the capacity of car parking at stations, to allow travellers to park and ride, are most severe at Inverkeithing although there are problems of a similar nature at other stations. To improve the population catchment area for rail, the consultants suggest additional stations may be required to cope with recent, and proposed, changes in the location of industrial, commercial and residential developments.

Road

4.26 'Level of Service[1]' is a long established traffic engineering concept which helps describe the differing road conditions and the way they affect the amenity enjoyed by road users in terms of speed, safety, drivers' comfort and vehicle operating costs. With increasing emphasis on the road user as a "customer", the use of 'level of service' as a description has increased in Britain in recent years.

4.27 Levels of Service "A" and "B" are both essentially free flow conditions with little congestion or delay; Level of Service "C" is acceptable in many urban conditions but would be regarded as unacceptable in rural conditions. Level of Service "D" relates to severe congestion and delay and would generally be regarded as unacceptable except for short periods in parts of large urban areas.

4.28 The following results are based on the average conditions during the busiest 500 hours of the year. The conditions described below are, however, so severe that they are actually experienced beyond 500 hours a year for many of the links. Figure 14 shows that in 1990 part of the A8 at Gogar and the A8000 were at Level of Service D, whilst the A8 from Newbridge to Gogar, the northern end of the A71 Calders Road, Maybury Road, the Forth Road Bridge and the A90, the A921 and A985 north of the Bridge were all at Level of Service C.

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[1] *Further explanation of the Level of Service analysis is contained within a separate technical report from the Trunk and Key Principal Road Network Review.*

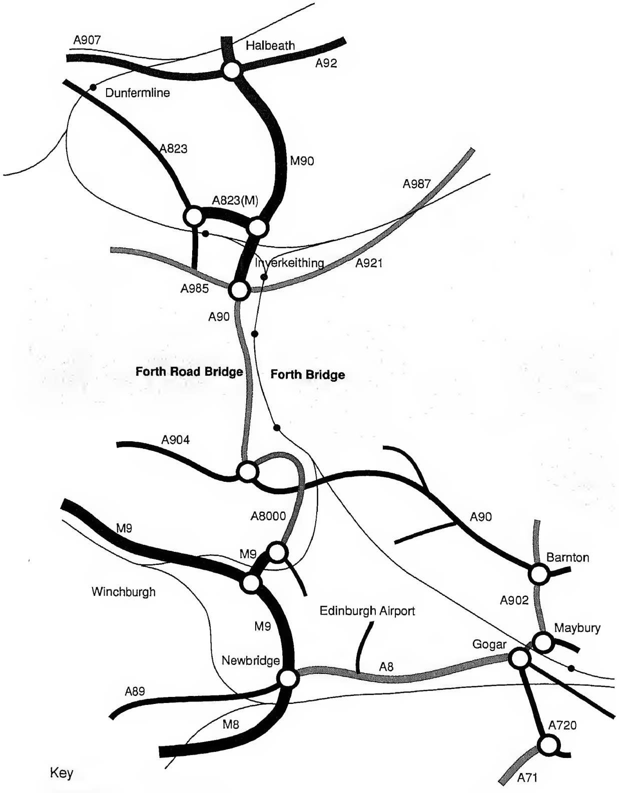


Fig 14 Level of Service '1990'
Average top 500 hours

Source: Trunk and Key Principal Network Review

4.29 As traffic volumes increase, if no changes to the present network are made, the 'level of service' is forecast to deteriorate so that by early in the next century virtually all of the strategic network within the study area would be at Level of Service D (see Figure 15). By early next century these poor levels of service will occur for many of the road links in the study area not only in the peak periods (as they do at present) but for most of the working day. This would be a serious concern for any network, let alone for some of the key sections in Scotland's strategic inter-urban network.

4.30 The 'level of service' analysis is concerned only with the capacity of roads between junctions. In the study area, several of the junctions themselves are a major problem. The analysis was therefore taken further by applying a more detailed assessment technique focusing on major road junctions and pressure points in the study area. The results of the analysis for the morning peak period are shown in Figures 16 and 17 for 1990 and for 10 years hence 2002 respectively. This analysis assumes that the M8 extension from Newbridge to Edinburgh City bypass will be in place and that scheme brings relief to the approaches to some junctions (eg Gogar and Newbridge in the southern part of the study area, as can be seen from the diagram).

4.31 What is also clear from the diagrams is the continued and increasing difficulties in all other parts of the study area. The expected queue lengths by year 2002 will seriously affect the network's ability to allow strategic traffic to traverse the area particularly during peak periods or whenever daylight maintenance, minor accidents or incidents occur. This is a consequence of the problems with the junctions on the periphery of Edinburgh and on the A90/M90 corridor in Fife. As an example, queues on the A90 could be expected

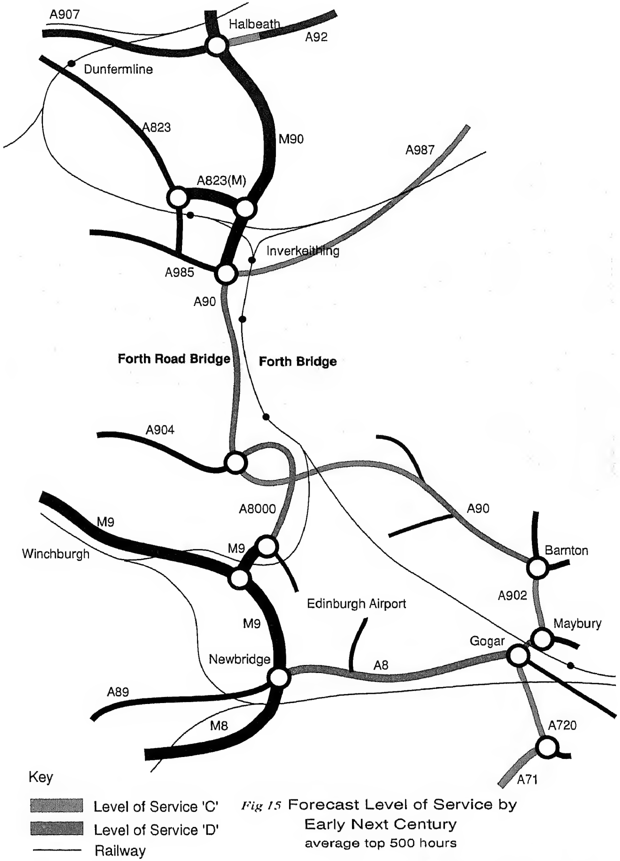


Fig 15 Forecast Level of Service by Early Next Century
average top 500 hours

Source: Trunk and Key Principal Road Network Review

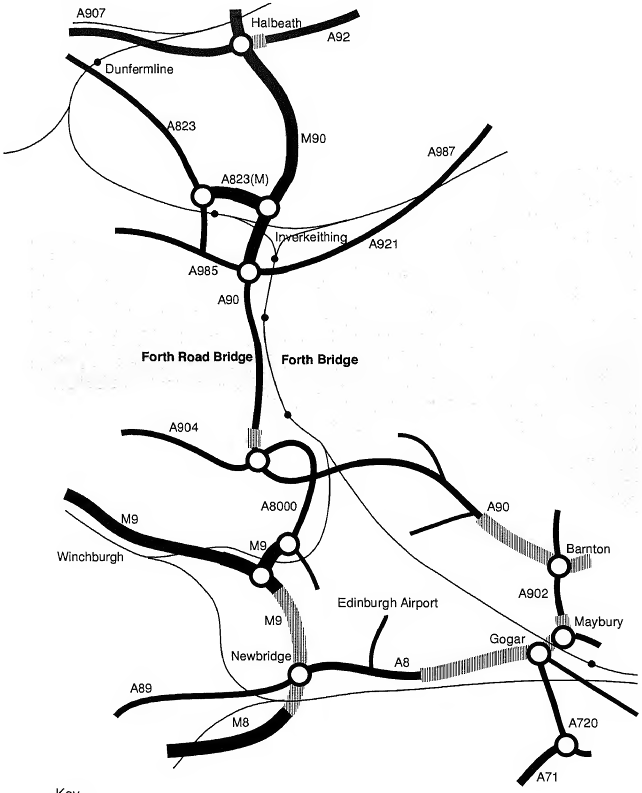


Fig 16 Queue Lengths in 1990
Morning Peak Period

Sources: Forth Road Bridge Short Term Measures

to stretch from Barnton to near the A8000 flyover, a distance of over 5 kilometres, by the year 2002. Queues at Newbridge from the M9 and A8000 approaches would also increase in length and frequency in the future beyond current levels.

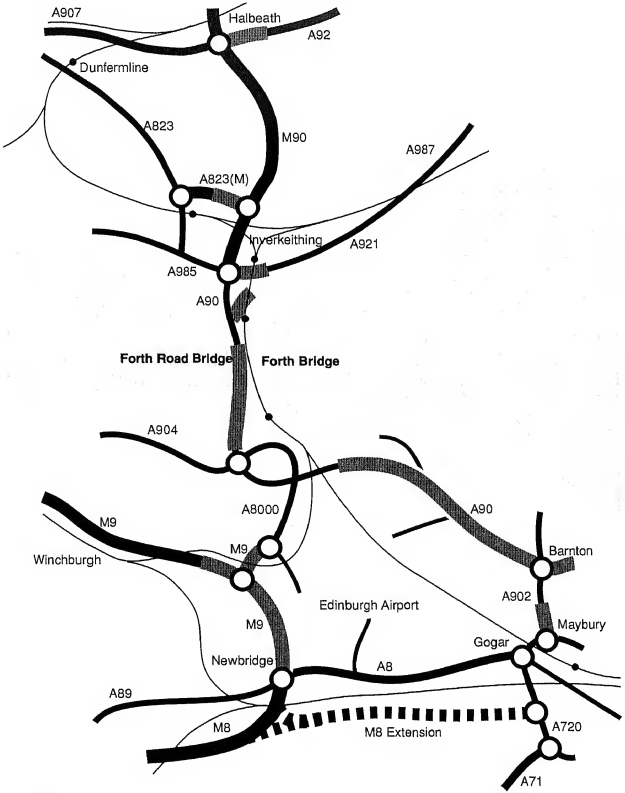
4.32 A number of years ago it was often argued that such severe forecasts were implausible. Experience around the world in the 1980s has however confirmed that queueing and delays on this scale on the peripheries of cities do indeed occur. Certainly, conditions today in the west of Edinburgh are very markedly worse than 10 years ago (although the opening of the A720 Edinburgh City bypass has relieved the pressures significantly on some routes).

Kincardine Bridge

4.33 A full week of roadside census surveys was carried out at Kincardine Bridge in 1990 during the same period as the first of the Forth Road Bridge

The mathematical laws of queuing are well known and unforgiving. They are widely applied in commerce and industry for planning and operating customer services. When a facility operates up to around 85% of capacity, queuing and delays change little. Around 85%, small increases in demand or drops in capacity cause delays to vary markedly. In this way traffic is noticeably worse on rainy days and better in school holidays. It also explains why delays at congestion blackspots, such as Newbridge roundabout, change from minor to major hold-ups in a handful of years.

surveys. The information from these surveys was used in the traffic model analysis of test network strategies centering on Kincardine. The results of these tests show that the origin and destination pattern of trips that would use any enhanced network centering on Kincardine Bridge, or an adjacent replacement bridge, is quite different to that of trips using the Forth Road Bridge. The work carried out showed little transferability between Forth and Kincardine bridges under normal operating conditions. An additional crossing in the Kincardine area, even when part of a major road network improvement such as a 'West Fife Regional Road' linking the new crossing to the M90 Halbeath interchange, was shown not to materially affect the movements and problems within the study area.



Key

▨ Projected queue length in 2002

— Railway

Fig 17 Projected Queue Lengths in 2002
Morning Peak Period

Sources: Forth Road Bridge Short Term Measures

5. The Possible Measures and their Effects

5.1 After considering the existing and likely future problems on the transport network in west Edinburgh, the bridgehead area of Fife and over the Forth a range of phased proposals have been put forward by the various consultants to address the difficulties. The proposals fall into 3 broad time horizons, short term, medium term and long term (up to 5 years; 5-10 years; and greater than 10 years respectively).

Short Term Measures

Rail

5.2 The view from the consultants commissioned for the South Fife to Edinburgh Strategic Rail study is that there are effective improvements that can be introduced on the rail network in the short term. The consultants are likely to recommend that ScotRail should consider the case for adding additional rolling stock to the peak hour trains both to meet the growing demand and to improve passenger comfort. For the off-peak periods, the consultants are examining a revised timetable which, taken with additional train services also under consideration, might lead to an improved service on the Fife Circle which ScotRail may find commercially attractive.

5.3 In terms of infrastructure, the consultants are expected to recommend that consideration be given to the building of additional stations on the Fife Circle and indeed there is already a commitment for an additional station near Glenrothes. A further possible recommendation is likely to be that an increase in the number of car parking places should be considered by Fife Regional Council and ScotRail to cope with the growing demand for park and ride from south Fife to Edinburgh. Whether this should be at Inverkeithing or elsewhere will also be addressed.

5.4 These recommendations, if implemented, would result in an improvement in the accessibility, reliability, comfort and frequency of rail services. This would help allow rail to improve its competitiveness and strengthen its position to retain or improve its market share of journeys between south Fife and Edinburgh. However, in terms of the overall transport network in west Edinburgh, the bridgehead area of Fife and across the Forth, any increase in rail patronage is likely to be small when compared to the numbers on the road network and to offer relief in the order of 1-2% of road traffic volumes.

5.5 The figures quoted earlier indicate the difference in passenger loadings between the busy peak periods (100% loading) and the off-peak periods (55% loading). They highlight a classic transport dilemma for ScotRail. Railway stock is particularly expensive to buy and maintain and for operational reasons not amenable to running as a single unit. A 2-car Sprinter set costs just over £1m which is about 7 times the cost of a double decker bus. For investment in additional rolling stock to be worthwhile, the expensive stock has to be used productively for more than a few hours on weekdays. Rolling stock in use only for weekday peaks would be very difficult to justify. Investment in additional rolling stock therefore needs to be made when additional peak and off-peak services, taken together, show an adequate return on investment. Investment which does not meet British Rails' normal financial criteria may however be justified in exceptional circumstances on cost benefit grounds where there are sufficient external benefits, for example from the relief of road congestion.

5.6 The consultants are also considering a strategy to improve the accessibility of west Edinburgh for rail travellers from south Fife. This could involve a feeder bus network to link with trains at South Gyle station or, in the longer term, a possible Edinburgh Airport station.

Road

5.7 The Forth Road Bridge Short Term Measures consultants are finalising recommendations on a range of short term measures that will improve the efficiency of the road network in the study area by reducing delays and congestion particularly in the peak periods.

Traffic Management Measures

5.8 The recommendations from the Short Term Measures study are likely to include:

- improvements to the toll plaza and toll collection procedures on the Forth Road Bridge. The most significant of the proposals considered under this heading is a redesign of the toll plaza in combination with the introduction of one way tolling in the northbound direction. This would eliminate toll collection in the southbound direction (and difficulties associated with this collection which include delays in the morning peak period, and other busy times). This in turn would reduce the structural wear on the bridge from dense southbound vehicle queues because of delays at the toll booths. Another of the consultant's recommendations is that new toll collection technology might also be appropriate. This however will require rigorous testing and examination before any introduction to ensure that the technology is more efficient, reliable and cost effective than the existing system.
- the use of an advanced driver information system centering on the Forth estuary to allow some drivers on

the inter-urban road network to adjust route in the face of day to day problems of accidents, weather, maintenance and other incidents ahead. This system will use the latest variable message sign technology at approximately 20 strategic points on the motorway and trunk road network to provide information on hold-ups to drivers. Work will begin this year and the system's first phase will be in use in 1993.

- the promotion of more park and ride facilities to encourage car users to switch to buses for journeys between Fife and Edinburgh.
- improvements in the traffic management arrangements on roads and at road junctions within the study area to reduce delays and afford greater priority, if possible, to buses and coaches.

Pricing

5.9 A further, more difficult, possibility which has been raised in the course of the study is that higher tolls on the bridge might be charged at peak times with lower tolls at off-peak periods so as to encourage more efficient use of the scarce road capacity. There is a sound body of economic theory to argue that this might produce overall benefits to transport system users as a whole. Telephone networks and electricity supplies are, for example, priced in this way to encourage off-peak use as opposed to peak use.

5.10 On road networks, a relatively small change in traffic volumes has a disproportionate effect in increasing congestion. So significant benefits in reduced travel times and vehicle operating costs can arise to all road users if a small percentage of traffic were not to travel at peak time and traffic flows reduced. For example, some travellers might re-schedule their journeys to travel before or after the peak, or neighbours might arrange to share a car on convenient days, or public transport might be taken, or freight hauliers might consolidate loads, and so on.

5.11 Whatever the theoretical arguments, if pricing were pursued it would have to be accepted that increasing the toll on the Forth Road Bridge at the peak period would increase the out of pocket costs of those who continue to travel at that time. They would, however, benefit because their travel times and vehicle operating costs would be lower than would otherwise have been the case: and those still travelling at peak times would presumably have judged that the peak toll is worth paying, as compared to the alternatives available. The peak prices might, however, have to be quite high (relative to present toll levels) to have any worthwhile effect in reducing congestion. For example, few commentators believe peak period prices could be set at less than £1.50 each way to have any significant deterrent effect and these prices would also have to increase regularly at least as fast as inflation, to reflect changes in traffic demand.

5.12 Adopting differential peak/off peak pricing would also raise some practical issues of toll collection. It is unlikely to prove practical to introduce both one-way tolling and differential peak/off peak pricing.

Summary

5.13 In summary, evaluation by the consultants of the short term measures proposals put forward indicates that there are likely to be worthwhile localised improvements, providing limited, short-term relief to the study area as a whole. Such relief may be of significant value in deferring the time when further, more expensive, measures are required, but within a few years the benefits of most of the proposals will be overwhelmed by the effects of traffic growth and the consequential rise again in delays and congestion over the study area.

Medium Term Measures

Rail

5.14 It may be that not all of the proposed measures to improve rail could be introduced in the short term and that some of these proposals might fall into the medium term. Additional medium term measures that the consultants are likely to recommend are further proposals to improve the provision of park and ride car parking spaces in Fife and additional stations. In the peak hours longer trains and in the off peak more frequent trains are also potential options. They suggest that an additional station at Edinburgh Airport might be a possibility.

5.15 The signalling system on the approaches to Waverley and Haymarket stations, and the major tunnels between them, have only a limited further capacity. Any significant increase in the number of peak hour trains using the 2 main Edinburgh stations, arising from an increase in frequency on any of the main line services from the west and north, would require major investment to upgrade the signalling system, provide additional platform capacity and possibly even to provide additional tunnel capacity.

5.16 On optimistic assumptions about the future share of the market for travel between south Fife and Edinburgh, some future medium term investment in the rail network is likely to be worthwhile. Passenger numbers are likely to continue increasing gradually and rail should be able to maintain its market share of those trips for which rail is competitive. Rail's problem is likely to be that any improvements which require new track, signalling, platforms, tunnels etc would involve a significant level of investment.

Road

5.17 The consultants are likely to propose a range of possible medium term proposals to improve road based travel. Each of these are now described along with an assessment of their effects.

Improved Use of Bus and Coach

5.18 The existing use of bus services is small given the ability of buses to collect and distribute over wide areas of Fife and Edinburgh. With their lower cost structure and the greater ease with which buses can change route and frequency to match demand, as compared with rail, there may be scope for improvement in their market share if reliability could be improved. In any new strategy, it is therefore desirable that bus priorities be established wherever practical. However, the scope for this is very limited on the existing network but a simple and straightforward improvement for buses would be made possible with the proposed Barnton bypass described later. If this were built it would then become readily practical to provide a bus lane on the A90 without causing the congestion which would arise if one were provided at present. A Barnton bypass would allow the A90 to carry only Edinburgh bound traffic, so a bus lane on the approaches to a revised Barnton junction could bypass residual congestion thereby increasing the attractiveness of bus and coach travel.

5.19 The consultants suggest that a dedicated facility, for either high quality buses and coaches or a guided light transit system could in principle be incorporated into new road links and a new Forth crossing. Such a system might link directly to Edinburgh Airport and a possible Edinburgh Western Corridor light rapid transit or Busway. This would provide the opportunity to travel to and from Fife, Tayside and the north-east directly into central Edinburgh, the Airport and the rest of the strategic network by a high quality or dedicated service. It could also present the opportunity to provide park and ride facilities in a number of areas including Fife, West Lothian and the periphery of Edinburgh. Further work would need to be carried out to see if congestion in the west of Edinburgh was acting as a major deterrent to a large potential market of bus travellers.

Fifth Lane on the Forth Road Bridge

5.20 An engineering analysis has suggested that the existing ForthRoad Bridge should be capable of being adapted to include a fifth tidal lane within its central reserve. Although some important safety considerations have to be evaluated further, it would be technically possible to provide a lane which could be operated either southbound or northbound to meet the traffic flow demand at the particular time of day. The cost of providing this lane would be approximately

£10 million at 1991 prices and would take at least 2 years to construct. The delays to traffic due to construction of this lane would be considerable as both offside lanes on the bridge would be required by the contractors during the construction period. The cost of this in disruption to traffic movements has been put at over £2 million per week by the time work might get underway on the proposal. Night time only construction would be possible but this would increase the construction period considerably and raise the construction cost. This method of working would still likely cause delays (although to a lesser extent) during the rest of the day and there would also be considerable operational and safety problems. The advantages of this proposal may therefore be insufficient to be worth the disruption involved in its construction.

Barnton bypass

5.21 A road strategy for west Edinburgh which appears economic-

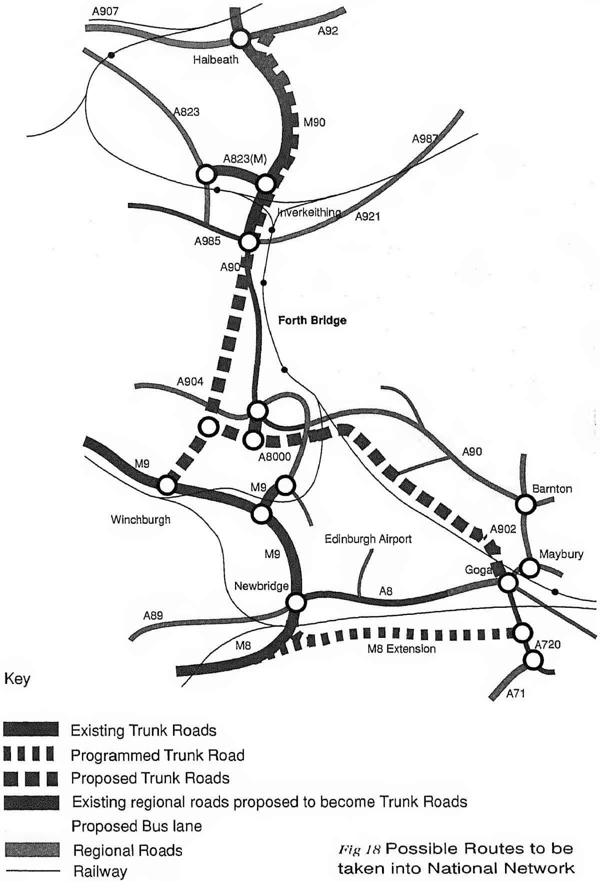


Fig 18 Possible Routes to be taken into National Network

ally attractive and likely to be environmentally acceptable has been developed by the review consultants. Their analysis shows that these proposals if accepted would do much to relieve the existing and projected congestion and delays at Newbridge, Gogar, Maybury and Barnton roundabouts as well as the A90, A8, M8, M9, A904 and A902 links.

5.22 There are 2 major proposals put forward. The first of these, shown in Figure 18, "the Barnton bypass", would start at a new free flow junction at Gogar and extend the City bypass on a north westerly line alongside the Fife rail line before tying into the A90 close to the existing Forth Road Bridge. This link would have the effect of separating A90 Edinburgh bound traffic from other traffic providing a bypass of Barnton and Cramond Brig.

5.23 The cost of this link is put at £40 million but it would provide a high rate of return on investment. By early next century it would be carrying a traffic flow in excess of 21,500 vehicles per day. It would also reduce future flow levels on the A90, A8 and M9 by 15,000 (28%), 5000 (10%) and 9,000 (18%). It would offer a small measure of relief to Queensferry Road and Corstorphine Road as more traffic now passing from or through Edinburgh would be encouraged to use the bypass.

M9 Link

5.24 The second proposal, the M9 link, is for a route from a new multi-directional junction on the M9 at Winchburgh to the existing Forth Road Bridge on a northeasterly line. This route would divert traffic from the heavily trafficked existing single carriageway feeder routes, the A904 and A8000 from central and west Scotland, on to the M9 which has substantial reserve capacity. It would also be of environmental benefit to the community of Newton on the A904 which would be bypassed.

5.25 In combination with the Barnton bypass extension, this route would provide a high standard grade separated route between the M9 and the strategic network east and south of Edinburgh via the City bypass. Longer distance traffic would be drawn from the M9/A8 and the A90/A902 routes providing relief to Newbridge, Gogar and Barnton junctions.

5.26 This proposal has a capital cost of £7.5 million. Taken on its own or in combination with the Barnton bypass it gives a very high rate of return. Combined with the Barnton bypass proposal it would provide considerable relief to the A904 and A8000 where future flows would be reduced by 7,500 (76%) and 5,000 (22%) respectively. The proposed road would be carrying a flow of 14,500 vehicles per day directly from the Forth Road Bridge to the M9. In the event of a closure of the Forth Road Bridge, the M9 link road could be used as a high capacity diversion route to the Kincardine Bridge.

5.27 The junction arrangements explored to date show both links could readily be adapted in the future to provide free flow access to any further Forth crossing in the locale. The environmental impact appears relatively small for proposals of this type. Issues which have been addressed in the preliminary environmental assessment included effects on landscape, ecology, built heritage, archaeology, amenity impacts and severance and indicated few areas of conflict.

A8000 - Forth Road Bridge to M9

5.28 Lothian Regional Council have a proposal within their current Structure Plan and Transport Policies and Programme documents for a scheme to upgrade the A8000 regional road between the A90 south of the Forth Road Bridge and the spur to the M9 north of Kirkliston. This proposal was considered, tested and evaluated by the review consultants. Although cheaper than the M9 link proposal they found that it was not an attractive strategic option since it produced only localised benefits. The A8000 did not, to any significant degree, provide the required relief to the network and so performed relatively poorly in traffic and economic terms. It is also incompatible with the other proposals in the area. For these reasons, this scheme is not recommended by the review consultants for further development.

Road Links North of the Estuary

5.29 Consideration of necessary improvements on the northside of the estuary led the review consultants to recommend a strategy based on upgrading the A90/M90 between Halbeath interchange near Dunfermline and North Queensferry by the addition of an extra running lane at an estimated cost of nearly £50m. This widening, possibly accompanied by upgrading of the A90 to motorway standard, would also require that the existing junction strategy be re-examined. Further careful consideration will have to be given to the future strategy for the corridor to provide good strategic and local access.

5.30 A further recommendation, regarded by the consultants as a higher priority, is the completion of direct slip roads to the A92 East Fife Regional Road on to the M90 at Halbeath at an estimated cost of £11m. This would resolve the growing difficulties at the Halbeath interchange by providing good access to this high standard special trunk road to East Fife.

5.31 These improvements are necessary if the increasing problems of congestion and delay are to be avoided on these heavily trafficked routes particularly during periods of maintenance or when incidents or accidents occur. The total cost of these proposals is put at around £60 million and they provide a good rate of return on investment. Flows on the southerly section of this corridor are estimated to be approaching 70,000 vehicles per day early next century whilst flows on the proposed direct slip roads to the A92 East Fife Regional Road will be almost 30,000 vehicles per day.

Longer Term Measures

A Further Forth Link

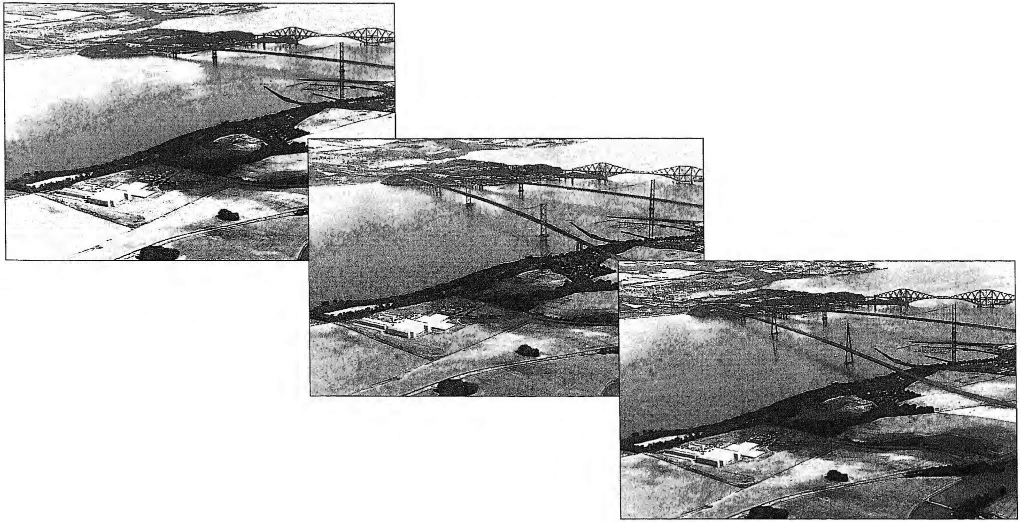
5.32 An important task within the Trunk and Key Principal Road Network Review was an assessment of the need for and timing of a further Forth Crossing. The work undertaken was wide ranging and included the general engineering, economic and environmental feasibility and costs. The relative attraction of differing types of crossing (ie immersed tube, stayed tube, bored tunnel and bridge types), and differing locations from Kincardine to Granton, were assessed with reference to the general desires of traffic using the existing bridges and the environmental issues of the area.

5.33 The clear recommendation from the review consultants is that overall a second crossing will be needed even if the medium term measures discussed above were implemented. Having regard to each of the engineering, environmental, traffic and economic criteria, a bridge crossing immediately west of the existing Forth Road Bridge would be the most favoured option and would cost in the region of £275m.

5.34 A summary table of the consultants' analysis is included as appendix A and shows the results for each of the 11 lines considered. A further table, provided as appendix B, summarises the environmental appraisal of the 5 options worthy of further analysis after the initial sift. The relatively restricted environmental impact of the proposed bridge, west of the existing bridge is, for a project of this scale, a major factor in the consultants' recommendation.

5.35 Any new crossing and associated road works must be environmentally acceptable and maintain or improve the superb setting of the existing bridges. The illustrative photomontages (shown in Figure 19) and environmental assess-ments prepared to date demonstrate that this would seem an achievable goal. Clearly further extensive environmental and engineering studies and development would be required to turn the concept into reality.

5.36 The engineering consultants' recommended strategy is based on running the proposed and existing bridges each in a single direction with the new bridge serving Fife bound traffic. This would best optimise the use of the existing and proposed roads and reduce the requirement for complicated and intrusive junctions. There would be cross-over links to



These 3 pictures illustrate the general view of the estuary. The first shows the existing 2 crossings. The second shows one design concept to "clone" the design of the Forth Road bridge to a pair. The third shows a design concept by the Consultants for a technology stretching cable stay bridge to the design concept for a "bridge for each century 19th, 20th and 21st". A competition for the design would clearly form part of the process if the project is taken forward in due course.

maximise available capacity during maintenance. Such a strategy would effectively halve the predicted flow on the existing Forth Road Bridge.

5.37 Results of the detailed traffic modelling analysis undertaken in the Trunk and Key Principal Road Network Review based on a strategy of the proposed network improvements in Fife and Lothian and an additional Forth Crossing are illustrated in Figures 20 and 21. The first plan indicates the flows on the proposed network early in the next century whilst the second illustrates the considerable degree of relief the proposals would bring to the network. Together these proposals show a good return on investment. In addition, each of the projects comfortably meets the normal value for money criteria, as do many other proposals which have not yet found a place in the trunk road capital programme.

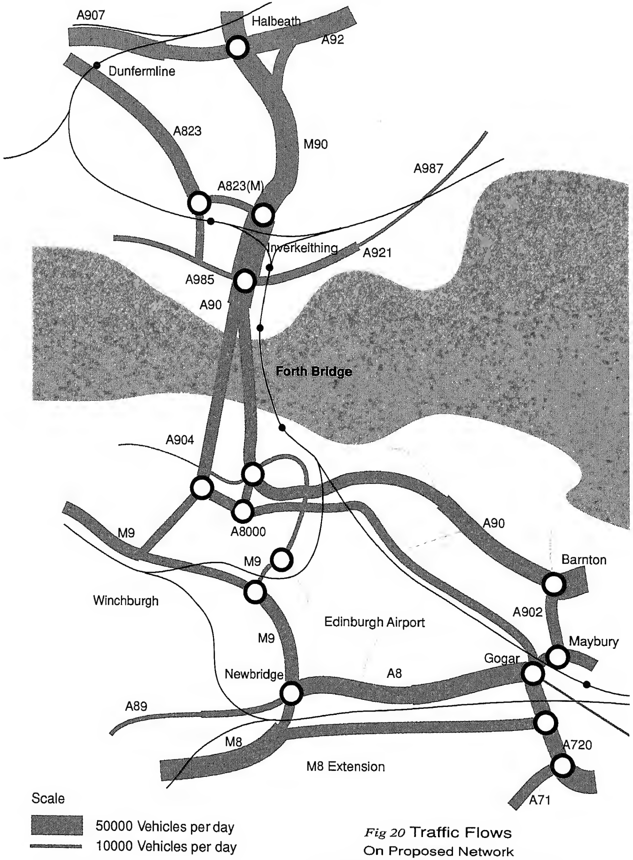


Fig 20 Traffic Flows
On Proposed Network
'Average Weekday Early Next Century'

5.38 In common with other key facilities which carry major flows, the full economic case for a further crossing contains a substantial element of benefit from the additional capacity which is available to cope with periods of maintenance or during incidents or accidents on the bridge. With no adjacent alternative routes available and with the existing high traffic flows increasing every year there is decreasing opportunity to carry out repairs and maintenance on the present Forth Road Bridge without causing major delays and congestion on the network. As regular road users are aware, the worst operational problems occur when capacity has to be temporarily withdrawn.

The drawing shows how, with the bypass extension and M9 link, through traffic moves directly onto the bypass and M9. This brings substantial relief to the Barnton, Gogar and Maybury junctions and further relief also to Newbridge in addition to the M8 extension. There is also some small relief to the Queensferry and Corstorphine travelling to the south and east of the centre. The A90 Queensferry Road now carries city-bound traffic and bus priorities to bypass the residual congestion at Barnton become practical without creating grid-locking queues.

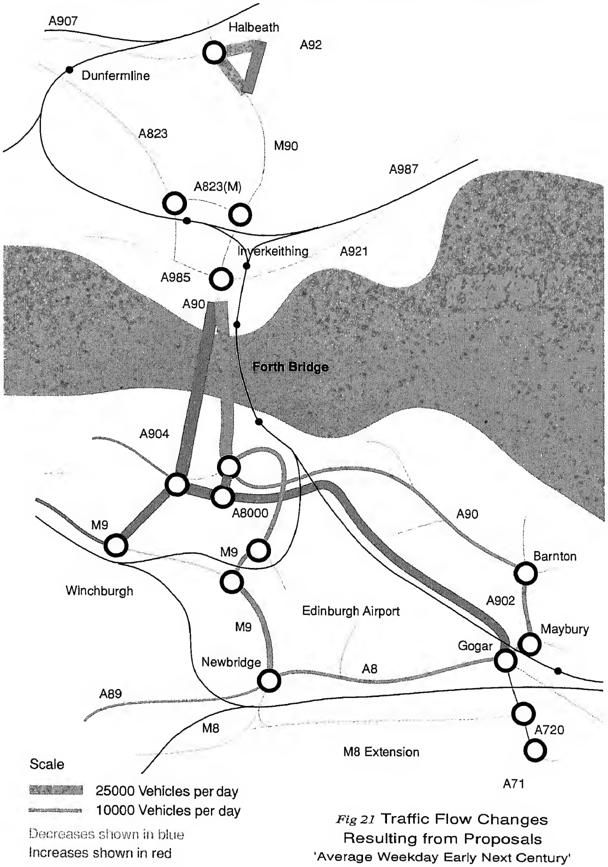


Fig 21 Traffic Flow Changes Resulting from Proposals
'Average Weekday Early Next Century'

6. The Issues for Consultation

6.1 The previous sections in this document set out the general facts and figures, problems and issues for travel around and across the Firth of Forth. What then are the choices and which provides the best way forward? With many factors and interlocking issues at different stages of development, not all the decisions can nor need be taken now. The purpose of this consultation is to set out the issues, suggest the way forward, invite views on these proposals particularly where answers are not so clear, and to propose the work required to enable future decisions to be made at the appropriate time.

Short Term

Traffic Management Measures

6.2 Whatever wider strategy is decided upon, the analysis suggests that various detailed improvements to the traffic management on the road network immediately around the Forth could help reduce congestion and delays in the shorter term. The improvements include measures such as more efficient toll collection methods on the Forth Road Bridge. (For example, one way tolling looks very practical and likely to have an immediate impact.) Taken together these should provide worthwhile benefits, perhaps counteracting effects of one or two years of traffic growth.

6.3 It is proposed that the responsible authorities should continue to work together to pursue these measures. Some of the more expensive short term measures will require further study. Preliminary indications are that these may offer poor value for money compared with accelerating medium term measures, particularly the Barnton bypass and M9 link, which may provide far greater traffic and environmental benefits.

Pricing Measures

6.4 The consultants advise that one of the short term options for relieving congestion on the bridge is the introduction of changes in the toll regime. It would be possible technically to increase the toll in the peaks and make off-setting reductions outside peaks so as to encourage those who can car share; or travel outside the peak; or travel elsewhere; or by another means such as bus or train; to do so. The large majority would probably continue to travel in the peak, and pay more, and few commentators believe that the peak price could be less than £1.50 to achieve any marked effect. Prices in the peak might subsequently have to rise faster than inflation if the effects were to be maintained. As indicated earlier it is unlikely to prove practical to introduce both one-way tolling and differential peak/off peak pricing.

6.5 This is clearly a difficult area with hard choices where views are most particularly sought. If general public support for pricing measures were forthcoming, it would certainly be necessary to study carefully the level of peak and off peak tolls required and the likely benefits.

Improvements to Rail

6.6 The South Fife to Edinburgh Strategic Rail study is examining the scope for improving rail services. The emerging conclusions from that study are that improvements to rail services including improved park and ride facilities, new stations and higher rail capacity at peak times, are possible and may be attractive to rail users, ScotRail and the Regional Councils. Many of these improvements might be achieved in the short term although some of the more expensive measures could take longer. These improvements to rail clearly help existing rail travellers and would be likely to be welcomed. But the key question for future road planning is whether the improvements possible are sufficiently attractive so as to cause a significant transfer of car drivers and passengers from road to rail or dissuade existing rail travellers from changing to car because of deteriorating comfort or convenience of a rail service.

6.7 During the peak periods rail is already capturing a large share of the market: around half of all trips from south Fife to central Edinburgh are made by rail where its natural advantages lie (namely in trips to and from a large area around Waverley and Haymarket stations). Together with bus, public transport is already capturing around two thirds of all mechanised travel to central Edinburgh from south Fife in the peak periods. Nevertheless some scope for a greater contribution from rail remains and it is proposed that this should be pursued. The possible impact of any further contribution to reduction in total road traffic is, however, limited. The speed and comfort advantages offered by rail travel diminish as the distance from a rail station at either end of the journey increases. The natural catchment area for rail travel in Edinburgh therefore lies within walking distance of Waverley and Haymarket where 80% of rail trips end. There will also be a growing demand for rail travel to and from South Gyle and rail services will need to be shaped to play their full role.

6.8 The traffic surveys conducted in the study area reveal a very wide dispersal of origins and destinations and of trip types. Many of these can and of trip types. Many of these can only be served effectively by road while for others the private vehicle is likely to remain the preferred choice of the traveller regardless of the incentives or disincentives introduced.

Improved Bus Links

6.9 While rail services must both follow a fixed track and carry significant traffic to gain from the large investment in track, staff and stock, buses can offer a cheaper and more flexible service to a greater range of destinations and have greater general scope to offer economic services. The Government as a general policy wishes to encourage greater use of buses for travel in cities.

6.10 The figures show that there is a low level of bus use across the Forth. Whilst this too reflects the diffuse nature of the underlying demand for travel (which works against all public transport even the taxi), road congestion may be reducing the attractiveness and thus affecting the competitiveness of bus travel. Work on short term measures shows there is little immediate specific action that can be taken to help. Operators can clearly continue to examine their schedules and the Bus and Coach Council can consider how bus travel can be made more attractive in speed, comfort and reliability. There may for example be scope in the short term for expanding specialist commuter services using higher quality coaches. Local roads authorities can consider the scope for greater use of bus priority measures on which the Government has recently issued practical guidance. However, the main scope for improving bus services may come in the medium term with the construction of new road links.

Medium Term

City Bypass Extension ('Barnton bypass') Proposal

6.11 The scale that growing congestion in the study area is likely to reach has been shown by the consultants to be of serious concern on the key links in the national inter urban strategic network. An extension to the Edinburgh City bypass has been proposed which would take through traffic directly to the existing Forth Road Bridge. This has many attractions. It would relieve the key junctions of Gogar, Newbridge, Maybury and Barnton. It would provide the opportunity to split city and non-city traffic so that appropriate traffic management policies for each could be pursued. In particular, it would provide the opportunity for peak hour bus priority on the A90 inwards to Barnton (with reversed outward priority for the evening flows) bypassing residual congestion. It would encourage more traffic on to the bypass and away from the Corstorphine and Queensferry Roads. It should also reduce road accidents and casualties on the west of Edinburgh road network. The extension would also provide the missing link in the high quality motorway/near motorway network which will be developed from Dunbar to Dundee via the Forth Road Bridge and Perth in the 1990s.

6.12 The proposed bypass extension would provide key road capacity between the west of Edinburgh, where very substantial new development is firmly committed, and the north. A spur to the airport might also prove worthwhile. The scheme has a high estimated economic return and the environmental impact appears limited since the road would follow the railway corridor for a significant length. If the road were built very quickly, it could provide an alternative 'relief' route during the period of reconstruction of the A90. This reconstruction, necessary as the existing road is at the end of its working life, would otherwise be the cause of very major delays for a sustained period. The bypass extension might also be used to provide enhanced and reliable bus services to link with the busway under consideration by Lothian Regional Council from the South Gyle to central Edinburgh. The budgetary estimate for the bypass extension is £40m. This is a significant sum despite its high economic rate of return which could not readily be found from existing programmes without sacrificing other priorities.

6.13 Consultees are invited to comment on whether they would support a full feasibility study of such a bypass extension.

An M9 Link

6.14 This proposal is for a short link allowing traffic from the Bridge to travel direct to the M9 near Winchburgh. The link would utilise an existing M9 overbridge so as to form a new junction midway between Junctions 1 and 2. Such a scheme would put long distance traffic travelling west from the Bridge directly and safely on to the M9 and so relieve the heavily trafficked A904 through the village of Newton. The link would improve access to and from South Queensferry. The combination of the Barnton bypass extension and M9 is more expensive than the dualling of the A8000 proposed by Lothian Regional Council but offers a substantially better strategic, traffic and economic performance. If the Barnton bypass and M9 link were pursued then the A8000 scheme would not need to be taken forward.

6.15 The proposed M9 link scheme appears to have limited environmental impact and has an exceptionally high economic rate of return. It is estimated to cost £7.5m.

6.16 Comment is therefore also invited on whether the feasibility of an M9 link should be fully explored.

Upgrading road links north of the Forth Estuary

6.17 The A90/M90 corridor has played an important strategic role in the transport network on either side of the

Forth Road Bridge since its construction in the 1960s and 1970s. Similarly the A92 East Fife Regional Road, the last section of which opened to traffic in 1990, is fast becoming one of the most important links within Fife. To resolve the increasing problems of delays and congestion on these routes the consultants have proposed that the A90 should be widened, and possibly upgraded to full motorway status, and that direct slip roads between the M90 and the A92 East Fife Regional Road should be provided. The junction strategy for the proposal and local access requirements in the corridor require further consideration.

6.18 The cost of these changes is put at £60m but again they would provide a high return on investment mainly through the reduction in traffic delays but also in accident reductions on these routes. Because the proposal is to provide additional road capacity on the existing road corridor, the environmental impact is likely to be small.

6.19 Views are invited on the proposal to widen the A90/M90 and to upgrade to motorway. Should this work and the proposal for direct access to the A92 have their feasibility fully worked up? And should the A90 north of the Forth in consequence be a national rather than a regional road?

Adopting the Edinburgh City bypass into the National Network

6.20 The strategic role of the Edinburgh City bypass has long been accepted and The Scottish Office paid grant to Lothian Regional Council to meet a share of its construction cost in recognition of the role it would serve. Discussions have taken place over a number of years as to whether and when the road should be taken into the national network. The M8 Newbridge-Edinburgh extension to the bypass has reached the final planning stage, and subject to completion of statutory procedures, a start to construction is planned for the financial year ahead. Scotland's future road plans include the extension of the A1 dualling to Dunbar, probably to the same near motorway standard as the Edinburgh City bypass. Detailed plans for the first section are very shortly to be published. It would therefore seem appropriate, if it is concluded that the M9 link and bypass extension should proceed, that they should form part of the national trunk road network of through routes and that the city bypass should be trunked on their completion. This would mean that the cost of future maintenance and improvement would be transferred from Lothian Regional Council to The Scottish Office.

Longer Term – A Further Crossing of the Forth Estuary

Maintaining a Single Forth Road Bridge Indefinitely

6.21 One option would be to retain a single bridge indefinitely. Tolls could be removed once arrangements for funding future maintenance and the short term measures had been established. However, these measures are expected to bring only temporary relief and congestion would be certain to grow. Major hold-ups would become more frequent throughout increasing periods of the year, with the existing congestion peaks extending further into the working day and at other times.

6.22 Random hold-ups resulting from minor accidents and incidents would become worse and happen more often. There would be substantial disruption whenever essential maintenance even of a minor nature had to take place in daylight. Traffic delay caused by problems of greater significance with the bridge in the years ahead would become very lengthy and difficult to tackle. The scale of the problems as traffic grows is probably appreciated by present users from the steady increase in incidents and delays to date but it is also well known from experience on similar facilities elsewhere. It is likely that the bridge would become widely regarded as an unreliable facility and a deterrent to economic links across the estuary.

6.23 Significant relief would however be provided if the proposed City bypass extension and M9 link were added to the existing bridge approaches. These links would marshal traffic more effectively on to the existing bridge. With the extension to take non-Edinburgh bound traffic direct to the bypass, a peak period priority lane for buses could be introduced to avoid residual congestion inwards to Barnton and could, in the evening, operate in the reverse direction. These links appear to merit a higher priority than a further crossing.

6.24 Without a new crossing, by the end of the decade (which is the earliest a new bridge could actually be provided), the critical link in the chain would be the lack of capacity on the bridge to cope with the high and volatile flows and the restrictions on capacity following from maintenance requirements on the network together with minor incidents and accidents.

6.25 Ruling out a further crossing at some time in the future does not, therefore, appear to be a serious option. At the strategic level, the road network to the north and south of the Forth Road Bridge is one of the busiest in Scotland reflecting the underlying vibrancy of the economy in the area. Some 1.5 million people in Scotland live north of the estuary and their economic future and strategic links must be planned for. At the local level, decisions must be made shortly about future development both north and south of the Forth. The accessibility to be provided by the main road network is a factor in these decisions. In addition, decisions on local roads and development will need to take account of these major links. The decisions to be taken by Government (both central and local) largely concern what actions can and should be taken, and when, in order to plan or to protect options for the future.

The Practical Feasibility of a new Forth crossing

6.26 The feasibility studies carried out into the many options show convincingly that if further road capacity across the Forth is to be provided, then this should be by a second crossing at South Queensferry. A further crossing here would have advantages over other possible sites on traffic, engineering, economic and environmental grounds. Running 2 road bridges as a pair gives maximum operational flexibility. Other crossing points, other than at Kincardine (where the cost of a new bridge is far smaller but has almost no impact on the Forth Road Bridge traffic loadings) would be very difficult and extremely expensive to construct. The relief of these other crossing points to the existing bridge would also be very limited. The environmental impact, taking all factors into account, has been assessed by the consultants to be greater at other sites. The environmental impact of a further crossing at South Queensferry, for a project of this scale, seems at this preliminary stage to be acceptable.

6.27 So an issue to be decided is whether to confirm the choice of South Queensferry as the location recom-mended by the consultants if a new crossing were to proceed at some point in the future.

Timing of Decisions on a New Crossing

6.28 Fife Regional Council and others have presented strong arguments that there should be a firm commitment to a new crossing now. They point to the long lead time required, perhaps 10 years, before additional crossing capacity can be provided and that such a major bottleneck in the national transport infrastructure cannot be countenanced as traffic continues to grow. The traffic forecasts used in the studies are also low in relation to historic growth and stand a good chance of being exceeded comfortably. Some of the fastest growing areas in Scotland lie to the north of the estuary and traffic volumes are growing faster on strategic links to the north than on other roads in Scotland. It is argued that the situation at the Severn Bridge head with existing and predicted flow levels, where preparatory work on the new Severn Bridge is already under way, is very similar to the Forth Road Bridge. The removal of the delays at Dartford by the new Queen Elizabeth II Bridge demonstrates the effectiveness of a second crossing.

6.29 Others have argued that problems on the bridge could be overcome by abolishing or improving the toll collection regime or by improving rail and public transport services or through pricing mechanisms. It has also been argued that building a new bridge will encourage more road travel, particularly into the heart of Edinburgh, which is itself undesirable.

6.30 It is likely to be common ground that operational improvements to tolls and traffic management can and should be made. The conclusion from the studies is however that the scope for resolving the growing road bridge problems from these improvements, and the improvement of public transport, is limited. There is perhaps some scope for the use of pricing measures but such measures are as yet unproven in practice. There is also a practical matter on which a decision is needed quickly. Currently there is demand to build over some of the land, as yet undeveloped, which a further crossing at South Queensferry would need. It would seem, if the option of such a crossing is not to be lost, that steps to protect the line should now be taken.

6.31 The timing of any decision to construct a new crossing is also important financially and economically. Each year expenditure is deferred on such an expensive facility means a large saving in national resource terms so long as the discounted value of the cost saved by deferral exceeds the benefits foregone such deferral is likely to be justified. If cheaper measures can provide equal benefits, even if only temporarily, they are clearly worth pursuing. Thus if the combined effect of the measures described earlier were to 'buy' 2-5 years depending on their success and the rate of traffic growth, they would be worth pursuing. However the focus of attention needs to be the expected position 10 years hence, the earliest the crossing could be provided. The cumulative effect of the other measures is expected to mitigate some of the effects of growth in the 1990s.

6.32 Views are therefore invited on 3 options.

6.33 Firstly whether, as a minimum, the line of a possible crossing at South Queensferry should now be protected but with no decision on whether or not such a crossing should be built until the effectiveness of the short term measures can be more accurately assessed.

6.34 Secondly, it could now be concluded that there is sufficient evidence that a further crossing is likely to be needed in the next 10 to 15 years to justify proceeding with more detailed investigation of the

feasibility and design of a crossing. Such work would fall short of a commitment to the construction of a crossing but would enable a crossing to proceed on a shorter timescale if this subsequently proved necessary in the light of traffic trends and the results of the other measures discussed above.

6.35 Thirdly, it might be considered that the weight of evidence from the various appraisals for a further crossing is conclusive and that The Scottish Office and others with an interest should now commit themselves to the principle of providing a new bridge and plan accordingly.

Environment

6.36 Any major transport proposal brings important questions of environmental impact. Change need not necessarily be for the worse and, indeed, the 2 existing bridges provide a splendid large scale demonstration of this. However, there are many levels and types of environmental impact varying from major effects on the landscape to the impact on very localised wildlife and habitat. A proposal may affect those using or enjoying particular land while the general effects of changes of traffic patterns may affect others.

6.37 The appraisal work carried out to date has indicated that the environmental impact of a crossing not far distant from the existing one is likely to be generally acceptable. There is substantial work yet to be carried out to take any project from this point and, in this, the Secretary of State's statutory advisers on the environment would be closely involved in the concept stages together with specialist environmental consultants to develop the design and assessment in detail.

6.38 The review "Roads, Bridges and Traffic in the Countryside" just published by The Scottish Office as a discussion document seeks views on the continuing improvement of environmental technique and it is suggested that some of the approaches described in that document might usefully apply to the development of any environmental proposals here.

Financial Issues

Public Funding

6.39 The competition for public funds for transport schemes remains fierce despite the recent substantial increases to funding levels for major capital projects. In 1991/92 trunk road capital expenditure for new construction and improvements was £145m. Except for the short term measures which would be paid for by the Forth Road Bridge Joint Board and for investment by British Rail and the private sector bus and coach operators, the road and transport proposals identified requiring public funding would mainly compete with other projects coming forward which would require to be financed outside the current 3-year public spending horizon. New projects cannot be brought forward without careful thought as to their priority and impact on existing programmes.

Policy on Tolled Road Crossings

6.40 It has been the policy of successive Governments that the very large estuarial crossings are tolled to seek to recover costs from the users who gain very substantial benefits from their presence. The cost of the large crossings is so substantial that they could not be funded from public programmes without diverting the total budget available for a period of years.

Potential Role of Private Finance

6.41 In the 1980s, the Government encouraged a new role for private sector finance to meet the rapidly growing demand for travel which has resulted from increased prosperity. Bringing in private finance allows the opportunity for more transport infrastructure than would otherwise be built. Major examples of this are the Channel Tunnel, and the Heathrow to Paddington rail link. On the roads, the Queen Elizabeth II bridge on the M25 at Dartford has recently opened and construction on a second Severn bridge is about to start.

Financial Position of a New Crossing

6.42 The financial situation at the Forth is however significantly more advantageous than that at the Severn. With the Forth Road Bridge poised to pay off its capital debt by 1994, future tolls collected will be restricted by current legislation to those necessary to provide for future operation and maintenance. If no other action were taken, tolling would cease once an adequate sinking fund had been created. If a decision were taken to proceed with a new crossing, new legislation would be required to wind up existing affairs and regulate the finance and operation of the 2 bridges. The new legislation might provide for continued tolling of the existing road bridge so as to provide further capital and revenue ahead of construction and for any sinking fund to be rolled up into maintenance arrangements for both bridges. Future toll levels would therefore not have to carry a burden of debt from the first crossing.

6.43 Views are invited on whether continuation of tolling as described above appears the most satisfactory means of funding any new crossing and assuring the future maintenance of the present bridge.

Public and Private Finance

6.44 It is Government policy that, in considering whether public or private procurement and financing is appropriate for crossings of this type, a study is undertaken into value for money. For example, the Government can borrow money more cheaply but may have to underwrite certain risks or cost overruns; a private developer may be able to tap various proprietary advantages.

6.45 Following the Government's general consultation paper on "New Roads by New Means", The Scottish Office received a number of approaches from banks, consulting engineers and contractors who expressed interest in seeking to bring forward a project on a similar basis as the other duplicate crossings at Dartford and Severn.

6.46 Views from the private sector will be of interest on how, if a decision to proceed with a further crossing is made, the package of design, finance, construction, maintenance and operation might best be put together.

Non Commercially Viable Public Transport Improvements

6.47 Powers exist to pay grant in the case of public transport investment that provides services which, while they may not be fully commercially viable, have worthwhile "external" benefits, commonly relief of road congestion. The Scottish Office has said that, resources permitting, it would in principle look sympathetically at bids for funds, supported by an objective appraisal, which identifies the value of these benefits. The Scottish Office gives guidance on how such bids should be formulated for such transport operations.

Other Key Issues

Development

6.48 This document describes the economic development issues around the Forth estuary. Currently, both Fife and Lothian Regional Councils are developing their Structure Plan proposals for local roads, transport and development. This consultation document is designed to help them formulate their plans particularly in respect of the emerging national roads proposals. From planning applications lodged in recent years, and discussion with the Regional Councils, it is clear that we should expect continued business development within Fife and Lothian which is likely to lead to further growth in traffic, particularly business traffic, across the Forth Road Bridge.

Kincardine Bridge

6.49 The possibility of a "West Fife Regional Road" linking the M90 Halbeath junction to a new crossing at Kincardine may form part of the wider network strategy for Scotland. In the light of work already carried out, which shows little transferability of traffic between Forth and Kincardine bridges under normal operating conditions, it is proposed to pursue the options relating to the crossing at Kincardine as a separate free standing issue.

7. Invitation to Comment

7.1 The Scottish Office would welcome comments on the proposals in this document. If you propose to respond to the study you should do so by writing to The Scottish Office Industry Department so that your response is received on or before 12 June 1992. If you wish your contribution to be treated in confidence, you should say so clearly when writing. Correspondence should be addressed to:

W G Welsh
The Scottish Office
Industry Department
Room 3/99A
New St Andrew's House
St James Centre
Edinburgh
EH1 3SZ

Telephone enquiries to:

(031-244-5189)

Appendix A

Engineering and Environmental considerations for a further Forth Crossing

Downstream from the Stirling area there are only 3 river crossings, at Kincardine some 13 kilometres distant and at the Forth Road and Rail Bridges, a further 22 kilometres. Beyond Kincardine the width of the Forth Estuary widens to 4.5 kilometres at Bo'ness narrowing again to 1.7 kilometres at South Queensferry before it opens out to the North Sea.

The geology of the Forth consists of a variety of faulted carboniferous rocks including coal. Overlying the bedrock is a range of deep sediments with many comparatively weak glacial gravels, silts, peats and clays. These sediments range in depth from 10 metres to more than 120 metres. There has been significant mining of coal, limestone and shale in and around the estuary for centuries particularly under the Forth in the Bo'ness and Grangemouth areas.

Much of the land on the foreshore is in agricultural use although there are significant areas used for industry, for instance at Longannet, Grangemouth and at Bo'ness. Land is used for defence purposes at Rosyth and Crombie Point. Residential settlements can be found at Kincardine, Grangemouth, Bo'ness, South Queensferry, Charlestown and Torryburn. Extensive commercial shipping activities are based at Grangemouth docks, Hound Point tankerberth and Braefoot oil terminal. Naval ships use Crombie Pier and Rosyth Naval Base and there are a number of facilities for smaller boats and pleasure craft. Trunk telephone cables and a number of pipelines carrying oil, gas and chemicals cross the estuary at a variety of locations. It can be seen from the foregoing, therefore, that the areas within and on either side of the estuary contain significant activity.

Environmentally there are a significant number of important and sensitive sites in the Forth Estuary at Skinflats, Kinneil, Torry Bay, Granton and Carling-moss. These are scattered along the foreshore and include Sites of Special Scientific Interest, Conservation Areas and Listed Wildlife Sites and are designated because of their importance to birdlife, geological exposures, plants and wildlife.

Historically at least, engineering decisions on estuary crossing locations and types were based purely on topography and geology. Close examination of the estuary has revealed the wisdom of siting the Forth Bridge and the Forth Road Bridge at the particular sites chosen. South Queensferry has the minimum estuary width, allowing the minimum bridge span. There is also solid bedrock on which to base foundations on the foreshore and on the islands in the estuary. Extremely difficult geological conditions have always meant that a tunnel under the Forth would be by far a more difficult proposition, in engineering terms, than a bridge.

In considering a further Forth crossing, the study included an examination of the ground, marine bed, tide and marine conditions and environmental constraints to be found at the sites likely to be suitable. The analysis also included consideration of the relative attraction of differing crossing types in engineering and environmental terms, and their effect on shipping.

APPENDIX A

Further Forth Crossing – Outline Environmental Appraisal Framework for Main Sites Examined

OPTION	ENVIRONMENT	DEVELOPMENT	ENGINEERING	TRAFFIC			ECONOMICS		SUMMARY
				GENERAL	EFFECT ON FRB	EFFECT ON KB	COSTS	RATE OF RETURN	
1A East of Kincardine	– Impact on SSSI and Ramsar Site at Skinflats Relieves Kincardine of traffic	– Few new opportunities arising – Southern approach lies within green belt	– Good geological conditions for multispan bridge – New bridge could allow significant savings on maintenance costs for existing Kincardine Bridge	– 10% relief to Kincardine – AADT 33600	None	100% reduction	£35M	High	– Good scheme in engineering, traffic and economic terms. – Poor scheme environmentally due to SSSI.
1B West of Kincardine	– Relieves Kincardine of traffic	– Few new opportunities arising – Southern approach lies within green belt	– Good geological conditions for multispan bridge – New bridge could allow significant savings on maintenance costs for existing Kincardine Bridge	– 31% relief to Kincardine – AADT 36100	None	100% reduction %	£37M	High	– Good scheme in engineering, traffic and economic and environmental terms.
2 River Carron to Longannet	– Severe impact on SSSI and Ramsar Sites at Skinflats and Torryburn – Impact on Culross	– Few new opportunities arising	– Immersed tube required due to depths of estuarial silts	– Little relief	Min. (ii)	None	£300M approx	(i)	– Scheme rejected on environmental and cost grounds
3 Grangemouth to Culross	– Severe impact on SSSI and Ramsar Sites at Bo'ness and Torryburn – Impact on Culross	– Few new opportunities arising	– Extreme difficulty due to to depths of estuarial silts and mineworkings beneath. – Immersed tube required	– Little relief	12% reduction	15% reduction	£500M approx	(ii)	– Scheme rejected on environmental and technical.
4 Cerriden to Torryburn	– Severe impact on SSSI and Ramsar Site of Torryburn – Visually obtrusive over fore-shores. – Affects a number of Ancient Monuments and Listed Buildings	– Some opportunity on south side – Limited opportunity on north side due to Crombie Pier Defence establishment	– Depths of soft deposits preclude a bridge. An immersed tube would be required.	– Little Relief – AADT 13100	12% reduction	15% reduction	£476M	Low	– Poor scheme due to environmental impact and low traffic benefits
5 Abercorn to Rosyth Church	– Severe impact on south side to Hopetoun House parkland, Midhope Castle and Midhope Glen – Visually obtrusive on north side – Impact on Pattismuir	– Some opportunity on both sides of the estuary	– Depths of soft deposits preclude a bridge. An immersed tube would be required.	– Similar to Route 4	(ii)	Min.	£470M	(i)	– Poor scheme due to environmental impact and low traffic benefits

APPENDIX A

Further Forth Crossing – Outline Environmental Appraisal Framework for Main Sites Examined

OPTION	ENVIRONMENT	DEVELOPMENT	ENGINEERING		TRAFFIC		ECONOMICS		SUMMARY
				GENERAL ON FRB	EFFECT ON KB	EFFECT RETURN	COSTS	RATE OF	
6A West of Forth Road Bridge	– Intrusion into one listed building. – Affects listed wildlife site on north side	– Some opportunity afforded on south side of estuary	– Major bridge possible using rock in mid-channel. Spans similar to existing road bridge.	– Removes traffic directly from FRB	Reduced by 50%	None	£280M	Medium	– Best route environmentally – Large benefits to traffic – Rate of return increases if further improvements made north of the river.
6B East of Forth Bridge	– Obtrusive to existing bridge – Crosses SSSI on south side	– Minimal opportunity arising	– Structural problems due proximity of existing bridge. – Possible foundation difficulties on Inchgarvie – Major engineering works on north side along shore.	– Route 6A offers more flexibility with existing bridge	Reduced by approx 50% (ii)	None	£500M approx	(i)	– Less satisfactory than Route 6A on environmental technical and traffic grounds.
7 Cramond to Dalgety Bay	– Severe impact on SSSI at Cramond	– Minimal opportunity arising	– Requirements for a bridge are at the limits of technical viability	– Primarily benefits commuter traffic	Reduced by approx 34% (ii)	None	£650M min.	(i)	– Scheme rejected on environmental and cost grounds due to lack of traffic benefit
8A Cramond to Aberdour benefit. (west route)	– Severe impact to SSSI at Cramond	– Minimal opportunity arising	– 3 major bridges required – Doubts exist over geo-technical suitability for bridge foundations	– Primarily benefits commuter traffic	Reduced by 34%	None	£750M min.	(i)	– Scheme rejected on environmental and cost grounds and due to lack of traffic
8B Cramond to Aberdour (east route)	– Severe impact to SSSI at Cramond	– Minimal opportunity arising	– Major bridges required between islands. – Doubts exist over geo-technical suitability for bridge foundations	– Primarily benefits commuter traffic	Reduced by 34%	None	£750M min.	(i)	– Scheme rejected on environmental and cost grounds and due to lack of traffic benefit.

NOTES:
(i) Economic evaluation not undertaken
(ii) Route assignments not undertaken
(iii) All assessments include approach roads essential to each project

APPENDIX B

Occupiers

Sub Groups	Effect	Units	1A	1B	4	5	6A	Comments
Residential	Noise	Number of units within given distance of centre line.						
		0 - 50	0	2	3	4	1	
		50 - 100	0	2	0	10	0	
		100 - 200	23	3	7	23	17	
		200 - 300	25	6	17	39	69	
		Total	46	13	27	76	87	
		Number of houses benefitting from a reduction in traffic levels on existing roads.	Approx 50	Approx 80	0	0	0	All the identified properties are located within Kincardine fronting the A876, the A985 or the A977
	Visual Obstruction		0	1	3	0	1	
	Visual Intrusion	Number of properties suffering:						This assessment has been made without the benefit of precise details of cuttings, embankments and structures.
		Moderate - High	43	7	17	11	52	
		Low - Moderate	55	13	7	12	18	
		Total	98	20	24	23	70	
	Severance	Number of Movement Routes which each route will cross.						Movement Routes which are crossed are identified. Without more detailed design information it is not possible to state how many of those routes will be severed. (Dis) = Disused Rail Line with tracks still in place. Footpaths include both the existing and those proposed within Local Plans.
		'A' Roads	0	0	2	2	0	
		'B' Roads	1	0	0	0	1	
		'C' Roads	0	2	0	0	2	
		Farm Access Roads/Tracks	1	6	5	5	4	
		Footpaths	1	2	1	1	2	
		Rail Lines	1	1(Dis)	0	0	0	
	Disruption during Construction		Minor disruption at Kincardine and Haughs of Airth	Disruption at Kilbagie Mill and east of Bowtrees	Major disruption at Champany	Moderate - High disruption at Abercorn and Limekilns	Moderate-High disruption at Soulh Queensferry to Totleywells	
Commercial premises	Noise	Number of commercial premises with enhanced amenity due to reduced traffic levels on existing roads.	2	3	0	0	0	All the identified premises are shops, offices or cafes/restaurants within Kincardine, alongside the A876 or A985. Route 1B also includes the Pine 'n' Oak Cafe.
		Number of commercial properties suffering a noise increase.	1	2	2	0	2	Route 1A - Pine 'n' Oak Cafe (A876) Route 1B - Mansqn's Garage - Kincardine Power Station - Kilbagie Mill Route 4 - Champany Restaurant - Auldkirk Boarding Kennels Route 5 - Midhope Sawmill Route 6A - Port Edgar Marina - Queensferry Lodge Hotel
	Visual Obstruction		0	1	2	0	0	Kilbagie Mill - Route 1B Champany Restaurant - Route 4 Auldkirk Boarding Kennels - Route 4
	Visual Intrusion		2	5	2	0	2	As noise plus: Route 1A - Silver Forth Hotel (Vacant) Route 1B - Kincardine Power Station - Kennetpans Garden Centre - Bowtrees Garage
	Disruption during construction		Minor disruption at Kincardine and Haughs of Airth	Oisruption at Kilbagie Mill	Major disruption at Champany	No Effect	Oisruption at Queensferry Lodge Hotel.	
	Severance		Relief from severance for commercial properties within Kincardine	As 1A	Unknown as yet	As 4	As 4	Without the benefit of junction and structure details it is not possible to analyse new severance impacts.
Public Buildings a/ Haughs of Airth Tourist Information Centre	Visual Intrusion Noise		Slight Slight Increase	Slight Oecrease	No Effect No Effect	No Effect No Effect	No Effect No Effect	Diverting Traffic from the A876 onto route 1B will reduce noise levels at the Tourist Information Centre.
Farming	Distance in linear metres each centre line travels through agricultural land.	Grade 2	0	0	1300	1650	900	The numbers of different farms affected has not been determined as yet. Without details of embankments and cuttings it has not been possible to assess precisely, land take.
		Grade 3.1	120	680	1900	620	2650	
		Grade 3.2	1590	3480	300	0	0	
		Other	100		290	2100	0	
		Total	1810	4160	3790	4730	3550	

APPENDIX B

Users of Facilties

Sub Group	Effect	1A	1B	4	5	6A	Comments
a) Kincardine Town Centre	Reduction in pedestrian/vehicular conflict	Removal of traffic could allow pedestrianisation and environmental improvement	As 1A	No Effect	No Effect	No Effect	Policies T4 and ENV1 of the draft Dunfermline District Local Plan propose Environmental improvements for KincardineTown Centre.
b) Tulliallan Cemetery	Amenity Loss - Noise, Visual Intrusion	Moderate	No Effect	No Effect	No Effect	No Effect	
c) Bowtrees Garage	Visual Intrusion	No Effect	Slight	No Effect	No Effect	No Effect	
d) Haughs of Airth	Noise	Slight Increase	Slight Decrease	Severe	No Effect	No Effect	Tourist Information Centre and Pine 'n' Oak Cafe
e) Kennetpans Garden Centre	Visual Intrusion	No Effect	Slight	No Effect	No Effect	No Effect	
f) Mansons Garage	AmenityLoss - Visual Intrusion, Noise	No Effect	Slight	No Effect	No Effect	No Effect	
g) Champany Restaurant	Amenity Loss - Noise, Visual Obstruction	No Effect	No Effect	No Effect	No Effect	Slight	
h) Auldkirk Boarding Kennels	Amenity Loss - Noise, Visual Obstruction	No Effect	No Effect	No Effect	Severe	Severe	
i) Visitors to Hopetoun House and Grounds	Impact on the designed landscape.	No Effect	No Effect	NoEffect	Disruption to the designed landscape including possible severance of sea walks at North Deer Park	No Effect	
j) Abercorn Kirk	Amenity Loss - Noise, Visual Intrusion	No Effect	No Effect	No Effect	Moderate		
k) Port Edgar Marina	Amenity Loss - Noise, Visual Intrusion	No Effect	No Effect	No Effect	No Effect	Moderate	Port Edgar Marina is the sublect of major redevelopment proposals.
l) Queensferry Lodge, Hotel	Amenity Loss - Noise, Visual Intrusion	No Effect	No Effect	No Effect	No Effect	Moderate	

APPENDIX B

Policies for Conserving and Enhancing the Area

Policies	Authority	Interest	1A	1B	4	5	6A	Comments
a) To restrict development in open countryside	E.D.C., F.D.C., D.D.C., W.L.D.C., C.R.C., F.R.C., C.D.C.		Passes through open countryside along full length	As 1A	As 1A	As 1A	As 1A	The relevant planning documents are: Falkirk Disrict Council (F.D.C.), Rural Local Plan (Draft Written Statement, July '91) (Route 1A) Falkirk District Council (F.D.C.), Bo'ness Local Plan (Route 4) Dunfermline District (D.D.C) Local Plan, (Draft January '91) (Routes 1A, 1B, 4, 5, 6A) Central Region (C.R.C) Structure Plan (Finalised Draft & December '91 modifications) (Routes 1A, 1B, 4) Fife Region (F.R.C.) Structure Plan (Consultative Written Statement, Dec '91) (Routes 1A, 4, 5, 6A) Lothian Region (L.R.C.)Structure Plan (Route 5, 6A) South Queensferry Edinburgh District, (E.D.C.) Local Plan (Route 6A) Clackmannan District (C.D.C.) Local Plan (Finalised Draft, March '90) (Route 1B)
b) To prevent loss of prime quality agricultural land.	E.D.C., F.D.C., D.D.C., C.R.C., F.R.C., C.D.C.	Distance in linear metres each line passes through prime agricultural land (Grades 1,2,3.1)	120	680	3200	2270	850	
c) To prevent damage to Sites of Special Scientific Interest.	E.D.C., F.D.C., D.D.C., W.L.D.C., C.R.C., F.R.C., C.D.C.	Identified S.S.S.I.s at: - Skinflats - Torry Bay - Blackness to Port Edgar	Passes through Skinflats S.S.S.I.	No effect on S.S.S.I.'s but passes close to Listed Wildlife Sites on the northern shore.	Passes through Torry Bay S.S.S.I.	Passes through the Blackness to Port Edgar Coastline S.S.S.I.	No effect on any S.S.S.I. but passes through St Margaret's Marsh, a Listed Wildlife Site.	
d) To prevent damage to Scheduled Ancient Monuments (S.A.M.) and other archaelogical sites.	E.D.C., F.D.C., D.D.C., W.L.D.C., C.R.C., F.R.C., C.D.C.	S.A.M.s at: - Kennetpans - Carriden Roman Fort - Tuilyies Standing Stones - Midhope Castle - Rosyth Old Kirk - Duntarvie Castle Crombie Old Kirk is in the process of being Scheduled.	No Effect	Slight effect at Kennetpans disused distillery	Direct effect at: - Tuilyies - Crombie Old Kirk - Carriden	Direct effect at: Rosyth Old Kirk. Severance of relationship between Midhope Castle and Hopetoun House.	Direct effect on Duntarvie Castle, within 200m of the proposed line.	
e) To restrict development in designated green belts.	Falkirk D.C. Central R.C.	Identified Green Belt within Falkirk Rural Local Plan.	750 linear metres passing through Green Belt	No Effect	No Effect	No Effect	No Effect	
f) To prevent loss to important trees and Woodland.	Falkirk D.C. Dunfermline D.C. Lothian D.C.		No loss of trees	Loss of trees and severance of mature but derelict shelter belts south of Eastfield (south side) loss of trees west of Kilbeggie Mill.	Loss of important woodland at: - Champany - Stacks Farm - Corriden Estate - Craigflower Estate(*) - Torry Burn	Loss of important woodland at: - Philipstoun Estate - Midhope Glen - Fossockiehill Plantation	Loss of ornamental woodland at St Margaret's Hope	* Denotes trees covered by a Tree Preservation Order.
g) To initiate and Environmental Improvement Scheme within Kincardine Town Centre. (See comments)	Dunfermline D.C.		Removal of through traffic will greatly assist in the implementation of the policy.	As 1A	No Effect	No Effect	No Effect	* The scheme will include a review of parking, servicing, and pedestrian facilities, and will include a range of hard and soft landscaping. Removal of through traffic could enable the implementation of a pedestrianisation scheme.
h) To improve environmentally, the entrance points to Dunfermline District at Kincardine.	Dunfermline D.C.		The new bridge offers the potential for a new high quality "gateway" to the district.	Limited potential to create "gateway" at Gartarry Roundabout.	No Effect	No Effect	No Effect	Whilst routes 4,5 and 6A will not affect the entrance to Dunfermline at Kincardine, they do nevertheless create new gateway points along the north foreshore.
i) To initiate environmental improvements alongside the rail line at Torryburn.	Dunfermline D.C.		No Effect	No Effect	Will cross the rail line adjacent to Torry Glen, causing landscape disruption.	No Effect	No Effect	
j Tp protect Areas of Great Landscape Value (A.G.L.V.).	West Lothian D.C. Dunfermline D.C.		No Effect	No Effect	No Effect	Passes through A.G.L.V.'s for the whole of it's length on both sides of the Forth.	No Effect	

APPENDIX B

Transport, Development and Economic Policies

Policies	Authority	Interest	1A	1B	4	5	6A	Comments
Transport a) To develop a long distance coastal footpath along the Forth foreshore (north).	Dunfermline D.C. Fife R.C.		Will cross proposed route.	As 1A	Will cross existing footpath/track	Will cross existing footpath/track.	Will cross proposed route	
b) To develop a long distance coastal footpath along the Forth foreshore (south).	Falkirk D.C. Central R.C.		Will cross proposed route (South Alloa-River Carron Section)	As 1A	Will cross existing footpath/track (Bo'ness-Blackness Section)	No Effect	No Effect	Within Edinburgh district the Forth foreshore footpath is not identified in any local or structure plan.
c) To consider the construction of a new Forth bridge at Kincardine.	Central R.C.		In Accordance, but see comments.	In accordance	No Effect	No Effect	No Effect	The Secretary of State's Modifications to the Structure Plan place emphasis on the need for a new bridge not to impact on the Skinflats S.S.S.I. Route 1A would pass through the S.S.S.I.
d) To upgrade the A985(T) between Kincardine and Cairneyhill	Dunfermline D.C. Scottish Office		Will tie-into the A985 (T) along this stretch significantly increasing the number of vehicles it will carry.	No Effect	As 1A	No Effect	No Effect	
e) To improve the Parking and Traffic Management in Kincardine and Cairneyhill	Dunfermline D.C. Fife R.C.		Removal of through traffic will assist greatly in the implementation of the policy.	As 1A	No Effect	No Effect	No Effect	
f) To construct a bypass of Rosyth, between the A823(M) and Lochymuir Plantation.	Dunfermline D.C. S.D.D.		No Effect	No Effect	No Effect	Will tie into the proposed Rosyth Bypass.	No Effect	Whilst Routes 1A & 4 will not directly affect the Rosyth Bypass they will inevitably increase the numbers of vehicles using the A985 (T) at Rosyth.
Development a) Redevelopment Scheme at Craigflower Estate including residential, conversion of house to hotel or nursing home, recreation and environmental improvements.	Dunfermline D.C.		No Effect	No Effect	Will pass through estate causing loss of Policy woodlands and landscape disruption.	No Effect	No Effect	
b) Northof Kilbagie - Gas Pipeline	Clackmannan D.C.		No Effect	Will cross safeguarding zone identified in Local Plan	No Effect	No Effect	No Effect	
c) Kilbagie Mill - Industrial Development Opportunity	Clackmannan D.C.		No Effect	Prevents expansion to west	No Effect	No Effect	No Effect	
d) Grangemouth to Granton Gas Pipeline	Edinburgh D.C.		No Effect	No Effect	No Effect	No Effect	Will cross safeguarding zone identified in Local Plan.	
e) Grangemouth to Dalmeny Oil Pipe Line	Edinburgh D.C.		No Effect	No Effect	No Effect	No Effect	Will cross safeguarding zone identified in Local Plan.	

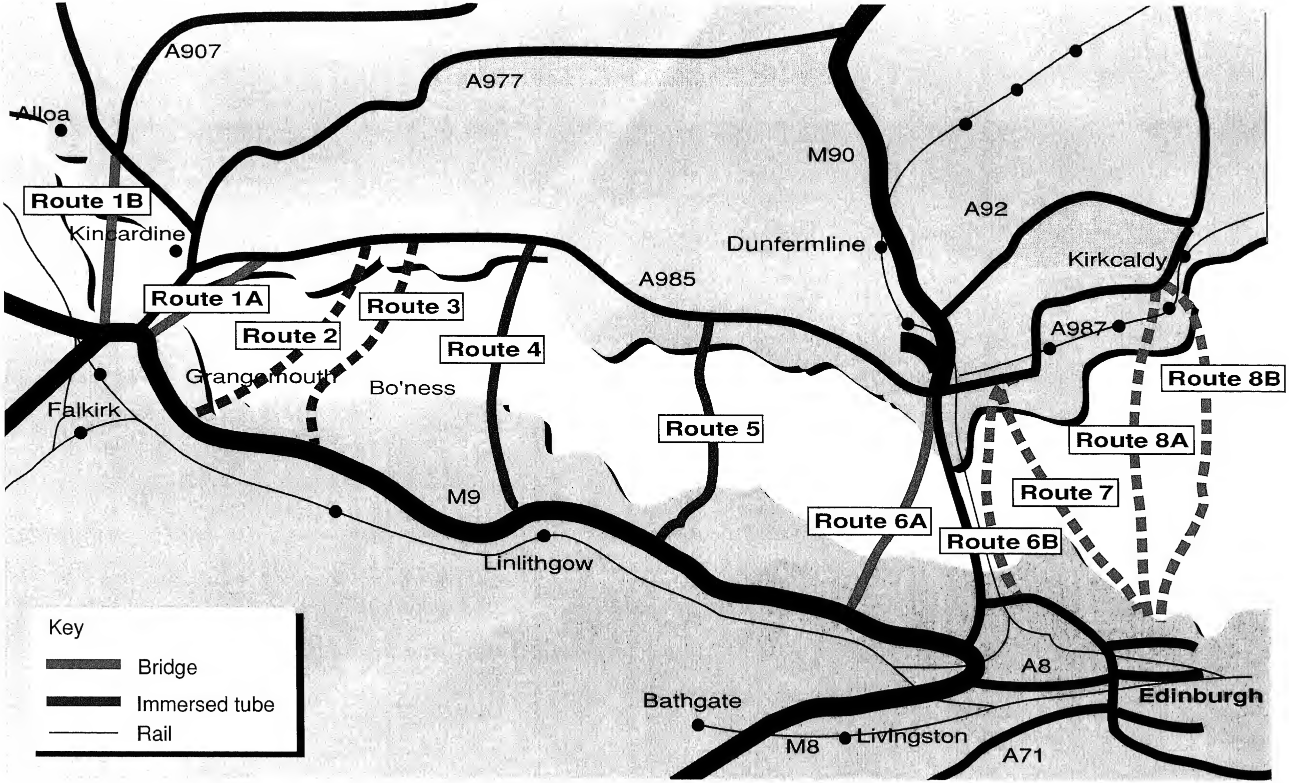


Fig 22 Possible Crossing Points

Source: Trunk and Key Principal Road Network Review